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NAVAL POSTGRADUATE SCHOOL

Monterey, California

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THE CAPACITY OF THE
NAVAL POSTGRADUATE SCHOOL
TO ABSORB ADDITIONAL
GRADUATE STUDENTS

by

Mark T. Timme

June, 1994

Thesis Co-Advisors:

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THE CAPACITY OF THE NAVAL POSTGRADUATE SCHOOL
TO ABSORB ADDITIONAL GRADUATE STUDENTS

by

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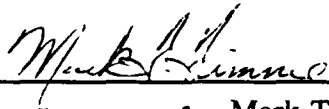
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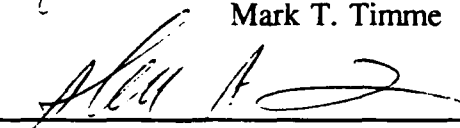
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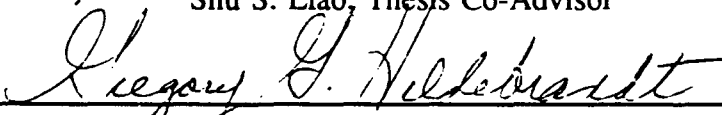
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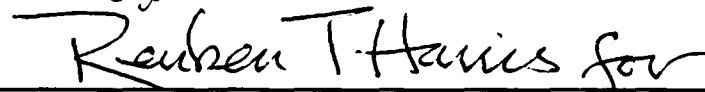
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ABSTRACT

One important issue in past Base Realignment and Closure (BRAC) hearings has been excess capacity of bases. This thesis evaluated the ability of the Naval Postgraduate School (NPS) to absorb the average yearly number of students now attending the Air Force Institute of Technology (AFIT). Both schools' curricula were reviewed and a course comparison, designed to see if NPS can cover the same course material found in AFIT curricula, was conducted. It was found that NPS courses matched 92% of all AFIT courses for Masters students. NPS capacity was examined and found to be able to accommodate the average students on board at AFIT without requiring major construction for classroom space. Faculty requirements were examined and it was determined that approximately 93 additional faculty members would be required to effectively teach the courses required for an increase of 450 students. The analysis suggests that both schools, AFIT and NPS, discuss the possibility of consolidating both schools at one site.

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I. INTRODUCTION

A. GENERAL ISSUE

If, as Services we get too critical among ourselves, hunting for exact limiting lines in the shadow land of responsibility as between ... (the Services), hunting for and spending our time arguing about it, we will deserve the very fate we will get in war, which is defeat. We have got to be of one family, and it is more important today than it has ever been.[Ref.1]

In April of 1993 the United States General Accounting Office (GAO) published an Analysis of the Department of Defense's Recommendations and Selection Process for Closures and Realignment. In this report the GAO criticized the Office of the Secretary of Defense (OSD) for not looking at cross service opportunities for consolidation and cost savings. With the 1995 BRAC process beginning these same opportunities should not be dismissed due to Service parochialism.

Secretary of Defense William Perry, in a memorandum concerning the 1995 Base Realignment and Closures (BRAC), states:

DoD Components and BRAC 95 Joint Cross-Service Groups should, where operationally and cost effective, strive to: retain in only one Service militarily unique capabilities used by two or more Services; consolidate workload across the Services to reduce capacity; and assign operational units from more than one service to a single base.[Ref. 8:p.4]

One area that was not mentioned in the memorandum but warrants looking into as an opportunity for potential consolidation is postgraduate education being taught at military institutions.

Currently the Air Force Institute of Technology (AFIT) and The Naval Postgraduate School (NPS) are the only military run postgraduate level institutions. Some Services do have postgraduate level programs in place at civilian institutions. One example is the financial management program the Army has established at Syracuse University. There are also programs whereby students attending one of the Service war colleges are able to obtain a Masters degree through a local university. All three Services also have programs whereby officers may be funded to attend approved civilian institutions to earn a Masters degree or Ph.D.

B. BACKGROUND

The idea of consolidating postgraduate education being taught at military institutions is not a new idea. In 1975 a major analysis was done by the Graduate Education Subcommittee of the Interservice Training Review Organization (ITRO) on the potential for consolidation of like programs between AFIT and NPS. This study was conducted during the military drawdown following the Vietnam conflict, a climate much like the drawdown occurring today in the post cold war era.

This analysis was followed by an updated report in 1978 which reviewed consolidation possibilities of five like

programs that were offered at both institutions. Table 1 lists those five programs. The 1978 report found that there would be large one-time costs associated with consolidating these programs at either AFIT or NPS. Also, the report stated that any annual cost savings from consolidation would be more than offset by the disruption and loss of responsiveness caused by consolidation. These and other findings will be dealt with in the analysis.

TABLE 1 - CURRICULA COMPARED AT AFIT AND NPS

| NPS | AFIT |
|---|--------------------------|
| OPERATIONS RESEARCH/SYSTEMS ANALYSIS | OPERATIONS RESEARCH |
| COMPUTER SCIENCE | COMPUTER SYSTEMS |
| ENGINEERING ELECTRONICS COMMUNICATIONS ENGINEERING | ELECTRICAL ENGINEERING |
| AERONAUTICAL ENGINEERING AERONAUTICAL ENGINEERING - AVIONICS | AERONAUTICAL ENGINEERING |
| ACQUISITION AND CONTRACT MANAGEMENT | PROCUREMENT |

In March of 1994 a report by the Under Secretary of Defense for Personnel and Readiness on the feasibility of consolidation of War and Staff colleges was completed. The report followed a November 9, 1993 conference report in which the U.S. Congress requested the Secretary of Defense look at:

potential cost savings from consolidation of the military services command and staff, and war colleges, and the administration Consideration shall be given to the progress that has been made on joint- and service-specific education . . . also consider possible enhancements to joint education and training that may result from consolidation of these institutions, and a comparison of savings achieved through vertical integration of the administrations within each service, including instances where such integration has already occurred,

With regards to geographic consolidations the study found that each Service war college is Service specific in its approach to teaching classes in order to provide a solid foundation which can then be applied in command and staff college joint classes. It also found that geographic relocations were not economically feasible because of the long length of payback(greater than five years). This long payback time was attributed to investments in new construction required to handle the increase in personnel. It also stated that:

Geographic relocation involves more than just the move of the primary academic buildings. It also involves the costs of moving various supporting organizations, which disrupts the cohesion of the educational institutions by reconstructing civilian faculty that may choose not to move, and impacts the infrastructures of the associated bases and local communities, as well as generating a ripple effect in regional economies.

In each of the instances that this study examined for possible consolidation it was assumed that no excess capacity existed at the consolidation site and therefore construction would be required.

C. PURPOSE STATEMENT

The purpose of this thesis is to judge the ability of the Naval Postgraduate School to absorb the average yearly number of students now attending the Air Force Institute of Technology.

D. RESEARCH OBJECTIVES

In examining a consolidation of AFIT programs at NPS the same type of questions that are asked of other interservice consolidation efforts can be asked here.

1. Does NPS have excess capacity to accommodate AFIT's student population(classroom, housing, etc.)?
2. Would additional faculty be required to handle this influx of students? If so, how many?
3. Are the facilities at NPS adequate to handle the additional research that would be expected from both the students and faculty brought to Monterey?
4. Can NPS establish individual programs to satisfy Air Force requirements that are currently being met at AFIT?
5. What are the cost implications for NPS from this consolidation?

E. SCOPE/LIMITATIONS

The main reason for looking at NPS capacity was ease of gathering information. Another reason was that NPS has

approximately 1700 students in its programs during the school year while AFIT has approximately 350 in its Masters programs and 100 in its Doctoral programs. One would think that the larger institution would be able to absorb the smaller institution much easier. This may not be the case but it was a presumption made in approaching this topic. The author is also expecting both schools enrollment figures to hold steady both during and after the ongoing drawdown. The assumption here being that the drawdown will require a higher percentage of those officers still serving to have a higher education in order to meet increased demands placed upon them. This assumption is consistent with NPS future enrollment numbers as shown in Exhibit 3-3.

An important area that will not be specifically analyzed is facility capacity at NPS for any lab equipment now at AFIT that is deemed unique and essential to instruction and ongoing research at AFIT. Instead, only excess capacity that already exists at NPS will be examined. Only those with technical expertise in the specific discipline can discern what, if any, equipment would have to be moved to NPS.

With regards to which instructors should come from AFIT to fill any increase in requirements, this thesis will only consider an overall number required at NPS to cover an increase of approximately 450 Masters and Ph.D. students that would move from AFIT. In comparing curricula between the two institutions, school catalogs, which listed required courses

for each degree and had descriptions for each course offered, were used. The course descriptions may not include the Air Force orientation/application which AFIT faculty may give the courses.

F. OVERVIEW

In approaching this topic one realizes that this is a sensitive issue for both the Navy and the Air Force. Both institutions are steeped in tradition and these schools serve a vital mission for both services in training their officer corps and in ongoing research. Why then, should consolidation be examined? It would seem that consolidating both schools would not only save money and fill up excess capacity at NPS but also help dramatically as the Services move towards jointness in many educational as well as military areas.

This balanced mix ensures the rich, fully joint environment essential to developing understandings across service and department lines and to forming friendships among the men and women destined to be among America's leaders. [Ref.2:p.56]

There are more issues involved in a consolidation besides excess capacity and consolidation of like services. However, two of the major areas that have been focused on in recent BRAC hearings are those of excess capacity and duplication of services. Both of these areas would seem to apply in this case and will be the areas that this thesis will address.

II. CONSOLIDATION OVERVIEW: A LOOK AT AFIT AND NPS

In looking at consolidating programs between AFIT and NPS one first needs to understand how these institutions came into being and what their missions have evolved to today.

A. AIR FORCE INSTITUTE OF TECHNOLOGY

The Air Force Institute of Technology is located on Wright-Patterson Air Force Base in Dayton Ohio. It was established in 1919 as the Army's Air School of Applications. In 1950, command jurisdiction of AFIT shifted from Air Material Command to the Air University located at Maxwell AFB, Alabama. AFIT has evolved so that, at present, its mission is to "support the Air Force through graduate and professional education, research and consultation." [Ref.1:p.1]

This mission requires that the Institute identify, conduct, and evaluate graduate and professional education which maintains the effectiveness of aerospace power as an instrument of United States policy. In other words, the Institute provides coordination between academic means and DoD ends by analyzing, comparing and matching higher education resources and Air Force educational requirements. [Ref.5:p.1]

AFIT postgraduate education is divided into two schools, The School of Engineering and the School of Logistics and Acquisition Management. Table 2-1 lists degrees offered at AFIT.

TABLE 2-1 - DEGREES OFFERED AT AFIT

| School of Engineering | School of Logistics and Acquisition Management |
|--|---|
| Aeronautical Engineering* | Acquisition Logistics Mgt. |
| Astronautical Engineering* | Logistics Mgt. |
| Computer Engineering* | Maintenance Mgt. |
| Electrical Engineering* | Supply Mgt. |
| Engineering Physics* | Transportation Mgt. |
| Nuclear Engineering* | Contracting Mgt. |
| Systems Engineering* | Cost Analysis |
| Applied Mathematics | Information Resources Mgt. |
| Applied Physics | Systems Mgt. |
| Electro-Optics | Software Systems Mgt. |
| Engineering & Environmental Management | |
| Operational Analysis | |
| Operations Research | |
| Space Operations | |
| Doctor of Philosophy (Eng) | |
| Applied Mathematics | |
| Aeronautical Engineering | |
| Astronautical Engineering | |
| Electrical Engineering | |
| Computer Engineering | |
| Engineering Physics | |
| Nuclear Engineering | |
| Operations Research | |

*ABET accredited degrees

The School of Engineering provides scientific and technological education in an Air Force research and development environment. The graduates of this school are assigned to widely ranging positions in a constantly changing technological environment. They must become not only practicing engineers but also broadly educated leaders capable of directing Air Force research and development programs.[Ref.1:p.25]

The School of Engineering is fortunate in that it is collocated with four major Air Force Aeronautical Laboratories with a combined budget of over one billion dollars. These facilities have been used without any accounting payment being charged to AFIT for both student and faculty research[Ref.3]. While one may say that AFIT is using idle time, there is an implicit opportunity cost to the laboratory by not contracting that excess capacity to another Air Force agency or civilian company.

The School of Logistics and Acquisition is the "Air Force's graduate school of technical management." The school's mission is to deliver modern tools and techniques of management to Air Force and Department of Defense Customers. The school carries out its mission through research, consulting, and teaching in the graduate education formats.[Ref.1:p.145-6]

AFIT is accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. Appropriate engineering curricula are also accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).[Ref.5:p.11]

In reviewing the 1993-1995 AFIT graduate catalog the number of faculty listed as instructors was 181. Of these, 91 were military with 77 of the 91 holding a Ph.D. Of the 90 civilian instructors 78 hold a Ph.D. Most faculty at AFIT are paid on a twelve month basis and are usually scheduled to

teach three quarters out of four each year[Ref.9]. While bringing in research dollars has not been emphasized in the past, AFIT is now moving towards paying its faculty on a ten month basis and requiring them to find research dollars to support the other two months[Ref.9].

B. NAVAL POSTGRADUATE SCHOOL

The Naval Postgraduate School is located in Monterey, California. It was established in 1909 and in 1947 Public Law 303, Title 10, U.S. Code established NPS as follows:

Be it enacted by the Senate and House of Representatives that the Secretary of the Navy is hereby authorized to establish the United States Naval Postgraduate School for the advanced instruction and training of commissioned officers of the Regular Navy and Marine Corps and the reserve components thereof in the practical and theoretical duties of commissioned officers... NPS is authorized, upon due accreditation... to confer bachelors of science, masters, or doctors degrees... on qualified graduates.

NPS has evolved today as an institution whose mission is:

To provide advanced professional studies at the graduate level for military officers and defense officials from all services and other nations. The school's focus is to increase the combat effectiveness of the armed forces of the United States by providing quality education which supports the unique needs of the defense establishment.
[Ref.7:p.7]

This mission was expanded in 1986 via SECNAV INSTRUCTION 1524,
May 23, 1986:

The Naval Postgraduate School exists for the sole purpose of increasing the combat effectiveness of the Navy and Marine Corps. It accomplishes this by providing post-baccalaureate degree and nondegree programs in a variety of subspecialty areas not available through other educational institutions. NPS also supports the Department of Navy through the continuing programs of naval and maritime research and through the maintenance of an expert faculty capable of working in, or as advisors to, operational commands, laboratories, systems commands, and headquarters activities of the Navy and Marine Corps. [Ref.7:p.7]

In keeping with this mission one of the functions of NPS is to:

Educate, as CNO may direct, commissioned U.S. Naval officers to the level essential for professional performance in validated billets in the Navy's subspecialty system. Educate other authorized U.S. and allied military officers consistent with the requirements of the individual services, Department of Defense (DoD), and foreign governments, within available resources. Educate civilian personnel within the U.S. Government consistent with their sponsoring organizational needs and within available resources. [Ref.10]

NPS is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges. Engineering curricula accredited by Accrediting Board for Engineering and Technology (ABET) are Aeronautical, Electrical and Mechanical. The Systems Management Curricula is accredited by the National Association of schools of Public Affairs and Administration. Table 2-2 lists the degrees offered by the Naval Postgraduate School.

TABLE 2-2 - DEGREES OFFERED BY NPS

| MASTER OF SCIENCE DEGREES | DOCTOR OF PHILOSOPHY |
|---------------------------------------|-------------------------------------|
| Aeronautical Engineering* | Aeronautical Engineering |
| Applied Mathematics | Computer Science |
| Astronautical Engineering* | Elect & Cmptr Engineering |
| Computer Science | Engineering Acoustics |
| Electrical Engineering* | Mathematics |
| Engineering Acoustics | Mechanical Engineering |
| Engineering Science | Meteorology |
| Management | Operations Research |
| Mathematics | Physical Oceanography |
| Mechanical Engineering* | Physics |
| Meteorology | Systems Management |
| Meteorology and Physical Oceanography | |
| National Security Affairs | DOCTOR OF ENGINEERING |
| Operations Research | Aeronautical Engineering |
| Physical Oceanography | Electrical and Computer Engineering |
| Physics | Mechanical Engineering |
| Systems Technology | |
| Systems Engineering | |
| Information Technology Management | |
| Engineer Degrees¹ | |
| Aeronautical Engineer | |
| Astronautical Engineer | |
| Electrical Engineer | |
| Mechanical Engineer | |

* ABET accredited degrees

¹ Typically requires one year beyond the Master's Degree.

In the 1993 NPS graduate catalog there are 404 professors listed with 53 military(four with a Ph.D.), and 351 civilian(326 with a Ph.D.). These numbers are compared with AFIT's in Table 2-3. As the table shows AFIT has more military instructors than NPS has. Also a much higher percentage of AFIT's military instructors have a Ph.D. This fact reflects the Air Force's commitment to higher education of it's non-rated officer corps. These instructors bring not only their educational background into their teaching but also their military experience and expertise.

Table 2-3 - AFIT FACULTY vs NPS FACULTY

| | AFIT | NPS |
|--------------------|-------------|------------|
| Total military #/% | 91/50% | 30/8% |
| - with Ph.D #/% | 77/85% | 4/13% |
| Total Civilian #/% | 90/50% | 351/92% |
| - with Ph.D #/% | 78/86% | 326/93% |
| Total Professors # | 181 | 381 |
| - with Ph.D #/% | 155/86% | 330/87% |
| Student population | 457 | 1810 |
| Stud/Faculty Ratio | 2.5:1 | 4.8:1 |

C. AFIT vs NPS

In trying to compare various curricula offered at AFIT and NPS, it is imperative that one look at the style of education used. Both schools employ a somewhat different education style. The AFIT approach is rooted in the idea that an officer graduating from AFIT will remain in his/her area of expertise throughout the rest of his/her career in the Air Force. This is then reflected in a course of study that primarily covers only the specific field. This could be characterized as a more narrow focus on developing a specific set of tools. Students at AFIT rarely take up a course of study that is outside the area of their bachelors degree. As an example students enrolling in the aeronautical engineering curriculum must have an undergraduate degree in aeronautical, astronautical, mechanical or systems engineering.

Also, at AFIT less than five percent of the student enrollment is made up of rated, or warfare designated, officers[Ref.9]. This same percentage is carried forward into the civilian institution program. It is not unusual for a rated officer to complete his/her career without obtaining a graduate degree. This goes back to the Air Force philosophy that rated officers need to be accomplished in their mission area and that a graduate degree will provide a smaller benefit to the Air Force in terms of enhanced war fighting capabilities than the high cost of providing rated officers

with this education. It should be noted that approximately twenty percent the Air Force's Officer corps is rated and eighty percent non-rated[Ref.9].

The NPS approach is based on the belief that throughout a Naval Officer's career, especially senior tour assignments, unrestricted and restricted officers will work in various fields. NPS, therefore, offers a more broad-based education giving its officers a wider base of knowledge to draw upon in future tours. It is also the Navy's view that a graduate degree will only add more to an unrestricted officer's ability in his/her warfare specialty. This is reflected at NPS more than 70% of its students being unrestricted, or warfare designated, officers. This percentage is in line with the overall Navy ratio of unrestricted to restricted officers.

Differences in teaching philosophy between the two schools reflect not only in courses taught but in the length of time students spend earning their masters or Ph.D degrees. The average program length at AFIT is 18 months while the average course length at NPS is 21 months. AFIT does, however, teach one month of refresher courses which is not included in its average time on board.

One reason for the difference in the average length of the two schools' programs is that NPS offers a more broad-based education. Another reason is that NPS students are not limited to any one field based upon their bachelors degree. Most students at NPS take refresher classes because they are

entering a different field than their bachelors degree or have been out of college for at least four years. These classes can last from three months for a student entering an area of study comparable to their undergraduate degree to one year for a student from a non-engineering background entering an engineering field. The time between when an Air Force Officer graduates from college and enters a postgraduate school is shorter than the typical NPS student[Ref.9].

D. CONSOLIDATION

The joint task group that examined consolidation of specific classes in 1978 felt that moving a curriculum from one school to another did not eliminate the need for all classes taught leading to that degree. An example would be the physics and computer science classes needed for a degree in electrical engineering(EE) at AFIT. Even though the requirement for these classes to be taught to EE majors would be gone, they could be found in other curricula which also require them. Thus while one may eliminate some teaching positions associated with an EE major, all positions cannot be eliminated.

Another issue of consolidation is control over one Service's students in a school run by another service. Right now both schools are able to set up individual curricula to meet its service's needs. The question arises as to what control, if any, the Air Force would have over its students

and the programs they are enrolled in if they were to attend NPS.

E. SUMMARY

When looking at the programs set up at both AFIT and NPS one can draw some common conclusions about both institutions. Both Services started these schools out of a need for specialized training that was not available through civilian institutions. Both schools are able to tailor their curricula to meet their individual needs and are also able to make changes as each sees fit in order to meet a changing world environment. Yet, while both schools have individualized programs, there are enough similarities between the two schools to warrant looking at consolidating and thus looking at NPS capacity.

III. METHODOLOGY

In trying to determine if NPS has excess capacity sufficient enough to absorb AFIT's student population one would: (1) identify the likely number of students involved; (2) examine individual courses taught for each degree at AFIT and see if a match can be found at NPS; (3) determine what the classroom/laboratory/housing capacity of NPS is and if there is enough excess whereby additional construction would not be required and; (4) discern if any additional faculty will be required to accommodate the influx of students.

A. IDENTIFY AFIT AND NPS INPUTS

AFIT enrollment as of 1 April 1994 is shown in Exhibit 3-1. AFIT student population is concentrated heavily in its Engineering School. Not only does it have almost twice as many enrolled in its Engineering School masters program than the School of Logistics and Acquisition Management, but 100% of all Doctoral Students are enrolled in the Engineering School. While the number of students attending AFIT masters level programs has declined in recent years, AFIT has made up for this decline with a 33% increase in Doctoral students. Because the average time onboard of an Engineering Doctoral student is three years the average number of students onboard

has shown only a slight decrease. AFIT is expecting current enrollment numbers to remain the same for the June 1994 class starting date. While this figure is expected to remain steady for the near term there are no projections past the June 1994 class. The Air Force reviews its requirements yearly for Masters and Doctoral student graduates. This enrollment figure is published in September of each year for the following year[Ref.6].

EXHIBIT 3-1 AFIT ENROLLMENT 1 APRIL 1994

Graduate School of Engineering

| Masters Program | # Students |
|--|-------------------|
| Astronautical Engineering | 12 |
| Aeronautical Engineering | 32 |
| Applied Physics | 11 |
| Computer Engineering | 7 |
| Computer Systems | 31 |
| Electrical Engineering | 42 |
| Engineering & Environmental Management | 35 |
| Electro-Optics | 10 |
| Operations Research | 20 |
| Systems Engineering | 7 |
| Space Operations | 15 |
| Strategic & Tactical Sciences | 10 |
| Subtotal | 232 |
| Doctoral Studies | 98 |

Graduate School of Logistics and Acquisition Management

| Masters Programs | # Students |
|---|-------------------|
| Acquisition Logistics | 18 |
| Cost Analysis | 12 |
| Contracting Management | 13 |
| Supply Management | 6 |
| Information Resource Management | 13 |
| Logistics Management | 26 |
| Maintenance Management | 8 |
| Systems Management | 17 |
| Software Systems Management | 3 |
| Transportation Management | 6 |
| Subtotal | 127 |
| Total Masters | 359 |
| Total Ph.D | 98 |
| Total Students | 457 |

NPS enrollment as of 1 April 1994 is shown in Exhibit 3-2. The NPS enrollment is not concentrated heavily in any one area of study. And, while AFIT has shown a decrease in its enrollment of Masters level students, NPS will be able to maintain a stable student population. NPS has accomplished this by increasing the number of Marine Corps and International students to offset the decrease in Navy Officers. The student average-on-board(AOB) projections up through 1998 are listed in Exhibit 3-3.

EXHIBIT 3-2 NPS ENROLLMENT 1 APRIL 1994

| NPS INDIVIDUAL MASTERS PROGRAMS | # Students |
|--|-------------------|
| Operations Analysis | 145 |
| Operational Logistics | 25 |
| Command, Control & Communications | 50 |
| Space Systems Operations | 45 |
| Computer Science | 120 |
| Information Technology Management | 156 |
| Meteorology | 3 |
| Air-Ocean Sciences | 41 |
| Operational Oceanography | 18 |
| Advanced Science(Applied Mathematics) | 20 |
| Oceanography | 9 |
| Undersea Warfare | 27 |
| Underwater Acoustics | 21 |
| Combat Systems Sciences and Technology | 78 |
| Engineering Science(Refresher Students 1-2 Qtrs) | 112 |
| Naval/Mechanical Engineering | 106 |
| Electronic Systems Engineering | 123 |
| Space Systems Engineering | 75 |
| Electronic Warfare Systems Engineering | 19 |
| Electronic Warfare Systems for Allied Officers | 10 |
| Communications Engineering | 13 |
| Aeronautical Engineering | 56 |
| Aeronautical Engineering-Avionics | 36 |
| National Security Affairs(Middle East, Africa, South Africa) | 28 |
| National Security Affairs(Far East, Southeast Asia, Pacific) | 15 |
| National Security Affairs(Western Hemisphere) | 10 |

| | |
|--|-------------|
| National Security Affairs(Russia, Europe, Central Asia) | 26 |
| National Security Affairs(Strategic Planning) | 36 |
| National Security Affairs(Special Operations/Low Intensity Conflict) | 22 |
| Transportation Logistics Management | 10 |
| Transportation Management | 15 |
| Acquisition & Contract Management | 42 |
| Systems Acquisition Management | 66 |
| Systems Acquisition Management for Allied Officers, DoD civilians, USA, USMC, and USCG | 27 |
| Systems Inventory Management | 6 |
| Resource Planning/Management for International Defense Intelligence | 31 |
| Material Logistics Support Management | 17 |
| Financial Management | 46 |
| Manpower, Personnel & Training Analysis | 64 |
| Total Masters Students | 46 |
| | 1815 |

EXHIBIT 3-3 NPS AOB PROJECTIONS 1994-1998

STUDENT AOB PROJECTIONS

| | 94 | 95 | 96 | 97 | 98 |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| <u>DON:</u> | | | | | |
| NAVY | 1158 | 1120 | 1102 | 1125 | 1125 |
| MARINE | 114 | 140 | 140 | 140 | 140 |
| SUB TOTAL | 1272 | 1260 | 1242 | 1265 | 1265 |
| <u>OTHER SERVICE:</u> | | | | | |
| ARMY | 202 | 179 | 179 | 179 | 179 |
| AIR FORCE | 36 | 32 | 32 | 32 | 32 |
| USCG/NOAA/CIV | 38 | 31 | 31 | 31 | 31 |
| SUB TOTAL | 276 | 242 | 242 | 242 | 242 |
| INTERNATIONAL | 232 | 225 | 225 | 225 | 225 |
| TOTAL | 1780 | 1727 | 1709 | 1732 | 1732 |

B. AFIT vs NPS COURSE COMPARISON

While it has been stated that AFIT and NPS both have different approaches to their Masters programs, both schools' curricula are accredited. Therefore, one would think that

comparable programs taught at both schools would have similar courses in their make-up. This theory lends itself to NPS more easily offering the same classes as AFIT than vice versa because NPS offers more courses for each of its degree programs than AFIT. The question thus arises as to whether the same course of study being taught at AFIT can be taught at NPS. In order to answer this question one must know what classes are taught at each institution and also have course descriptions for each class.

The AFIT catalog for 1993-1995 lists masters degrees offered and class requirements, with descriptions, needed for those degrees. The NPS catalog for 1994 lists masters degrees offered and class requirements, with descriptions, needed for those degrees. Utilizing these catalogs the author has interviewed professors at NPS in areas related to AFIT degree programs to determine if NPS can match class offerings at AFIT. What one would hope to accomplish by doing this is to find out not only what classes are duplicated between the two school but also what new classes may have to be created in order to fulfill Air Force requirements for its Masters Students. Appendix A lists course requirements for particular AFIT degrees and the NPS courses, if any, that are equivalent in course description.

In attempting to match up courses it was discovered that some courses taught at AFIT are being taught in two separate classes at NPS. This reflects the greater emphasis NPS has

put on the specific topics being covered. There were also instances where topics taught in two separate classes at AFIT are being covered in a single class at NPS. This reflects the greater emphasis that AFIT has placed on the specific topics being covered. Therefore, in Appendix A, some AFIT classes will have two NPS equivalent courses and different AFIT classes may have the same NPS equivalent course. The purpose was to see if NPS could cover the same material that was being covered at AFIT.

C. IDENTIFY EXCESS CAPACITY OF NPS

1. Classroom Availability

In identifying excess capacity at NPS one must first look at classroom availability, size and utilization. This was accomplished by examining the NPS Scheduler's list of classrooms available for the spring 1994 quarter. The author has assumed this availability to be representative of classroom availability for all quarters. This can be assumed because NPS staggers its enrollment dates throughout the year to maintain a stable student population.

Each classroom has a listed student capacity and the number of hours utilized during a 45 hour availability period(five days @ nine hours available each day). One realizes that it is possible to increase each rooms available hours to include night-time or weekend classes, but this study has attempted to fit AFIT students into the existing day-time

classroom schedule. While some classrooms can hold more than thirty students, the scheduler tries to limit class size to thirty students maximum. This will affect the average size of the available classrooms.

Most courses taught at NPS are four credit courses meaning that they meet for four fifty minute periods each week during the quarter. Therefore the total number of classrooms available for different courses would be nine periods per day times the number of classrooms available for use. There are currently sixty two available out of seventy three classrooms. This means that there are 558 classroom slots available for different courses. Some departments schedule their courses to meet for one period four times per week. Other departments schedule their courses to meet two periods back-to-back twice per week. In determining the number of extra courses which can be scheduled in each classroom at NPS the author has matched available time periods against the type of courses scheduled in that classroom(four times per week or two times per week).

If one can base the number of classrooms required as a percentage of students, it would follow that this percentage, if applied to the total population of NPS and AFIT, would yield the total number of classrooms required. If one then subtracts the number of classrooms actually scheduled in the spring quarter from the total required one would be

left with the incremental classroom requirement. The results are listed in Appendix B.

2. Laboratory Availability

Currently there are approximately 140 laboratories being utilized for regularly scheduled courses. Of these, 48 are scheduled by the NPS Scheduler and the rest are scheduled by the individual departments.

Each laboratory facility at NPS has its own unique scheduling requirements which affect its availability. While some labs could be changed between periods to suit different class requirements, others might required an hour between different lab set-ups. Other labs were limited by the fact that only one set-up could be accomplished per day. All these factors were taken into account to find lab availability. This number may not be a very reliable number because this thesis looked at one quarter's data and some labs may be utilized heavily in one quarter and sparingly the next. The results of laboratory availability are listed in Appendix C.

NPS also conducts academic research and RDT&E in its laboratory facilities. These areas are considered seperate from the student labs used for course instruction. The fact that NPS does conduct much of its research on site has allowed labs to acquire other pieces of equipment which add to their total capability.

There are difficulties in trying to arrive at a figure of significance with regards to excess capacity of labs. One can, for the most part, determine if excess capacity exists in classrooms and how many extra courses or sections can be taught. Each lab, however, is unique in its equipment and scheduling capabilities. NPS is in the process of conducting its own survey in which each department will individually assess the utilization and capacity of labs under their cognizance.

While it was not possible to conduct a viable comparison of laboratory facilities between AFIT and NPS some data was available on NPS laboratories and facilities. Exhibit 3-4 is a partial listing of military relevant laboratories and facilities utilized by various departments at NPS. While this list is not comprehensive it's purpose is to show the extent of NPS labs' capabilities and materials.

Exhibit 3-4 NPS LABORATORIES AND FACILITIES

General Facilities:

- Classified Reports Library
- Secure Compartmentalized Information Facility
- Point Sur IUSS array
- Research vessel "Pt. Sur"
- Secure Computing and Simulation Lab

Aeronautics and Astronautics Department:

- NASA computational fluid dynamics, NASA/NPS joint institute
- High angle of attack aerodynamics
- Solid propellant laboratory
- Composite aging laboratory

Electrical and Computer Engineering Department:

Search radars: UPS-1, SPS-12, SPS-40C, SPS-67
MK-25 tracking radar
PPS-6 anti-personnel radar
SLQ-32 EW receiver
ECM systems: ALQ-X, ULQ-6B, DLQ-3, WLR-1G
SIGINT lab
Captured equipment analysis
WARP real time target detection and identification array
Fiber-optic signal processing
Transient electro-magnetic scattering lab
HARPOON seeker

Mechanical Engineering Department:

Sea Wolf swirler model
Underwater vehicle test facility
Sea Wolf scale model for hydrodynamic testing

Meteorology Department:

Tactical Environmental Support System
Wind profiler(coastal zone)
Navy Ocean Data Display System
Interactive Digital Environmental Analysis lab

Oceanography Department:

Tactical Oceanography lab
MOSS Navy mobile support system
SMQ-11 satellite receiver

Physics Department:

Infrared Search and Track engineering development model
Charged particle beam diagnostics
Atmospheric optical propagation characterization system
Submarine sonar transducer performance diagnostics
Submarine fibre-optic hydrophone design lab

Space Systems Academic Group:

Complete FLTSATCOM including test and control equipment
Telemetry, tracking, and control data link for FLTSATCOM
to Naval Space Operations Center, Pt Mugu
TRANSIT satellite
Satellite test facility
EMI/EMC test facility
Space qualified ferroelectric memory experiment
Space Qualified ultraviolet ionospheric spectrometer
Thermo-acoustic cooler for space based sensors

3. Housing Availability

In determining available housing one must look at military housing first and civilian housing, if needed, second. With the recent closing of the Fort Ord Army base in the adjacent city of Seaside, NPS has become the sole custodian for housing units located on the Monterey peninsula. The housing areas include the NPS La Mesa housing area, Fort Ord housing area and the Presidio of Monterey, site of the Army's Defense Language Institute, housing area. The breakdown of available housing units is listed in Exhibit 3-5.

EXHIBIT 3-5 MONTEREY PENINSULA MILITARY HOUSING UNITS

| <u>Housing Area</u> | <u>Total Units</u> |
|---------------------|--------------------|
| NPS | 877 |
| Fort Ord | 1588 |
| Presidio | <u>93</u> |
| | 2558 |

While this is the total amount of available military housing on the Monterey peninsula all of it is not available for NPS students. Currently only the 800 NPS units and 600 of the 1588 Fort Ord units are available for NPS use. However, 130 units of the 600 NPS units at Fort Ord are designated as enlisted housing. Housing availability for NPS students was based on the number of units available and requirements to keep a certain number of units available for other commands on the peninsula. These other commands include the Coast Guard,

students at the Defense Language Institute and Army personnel that are still at Fort Ord.

Of the 1800 students attending NPS approximately 67% are married and require family housing, either military or civilian. This constitutes a requirement for approximately 1206 units(military or civilian). If these same percentages were to hold true for an additional 450 students, there would be a total requirement for 1507 units, with 302 being new requirements. Of the 2558 units available there are currently 1347 set aside for NPS students and Officer staff.

There are currently 41 permanent rooms available at the NPS BOQ for single students. At La Mesa housing there are 20 units in the process of being made available for 60 geographic bachelors. If one assumes that 67% of the NPS students are married requiring family housing than 33% should require bachelor housing. In applying this figure to the 450 additional students a new requirement for 149 single students would exist.

Those that are not able to acquire government quarters would be required to find housing in the local communities. The local area housing statistics are listed in Exhibit 3-6. The vacancy rates account for a total of 3561 units available.

EXHIBIT 3-6 VACANCY RATES FOR CITIES WITHIN 20 MILES OF NPS

| <u>City</u> | <u>-----Single-----</u> | | <u>---Multiple---</u> | | <u>Total</u> | <u>% Vacant</u> |
|---------------|-------------------------|-----------------|-----------------------|---------------|--------------|-----------------|
| | <u>Detached</u> | <u>Attached</u> | <u>2 to 4</u> | <u>5 plus</u> | | |
| Carmel | 2824 | 82 | 167 | 299 | 3372 | 6.00 |
| Del Rey Oaks | 568 | 29 | 24 | 112 | 733 | 5.05 |
| Marina | 3181 | 1412 | 1295 | 2107 | 7995 | 15.00 |
| Monterey | 5663 | 1102 | 2165 | 4735 | 13665 | 6.47 |
| Pacific Grove | 4827 | 511 | 975 | 1630 | 7943 | 7.48 |
| Seaside | 6178 | 2069 | 1046 | 1461 | 10754 | 6.00 |

D. FACULTY REQUIREMENTS

While there are 381 faculty members at NPS, they do not teach year round. NPS, on the average, has maintained a teaching to research ratio for its professors of 60 to 40 percent. This would leave the school with approximately 229 equivalent full time professors available to teach year round. While NPS pays all 381 professors, in actuality it only is paying for 229 equivalent full time professors. The 40 percent of the year spent conducting research is paid with reimbursable dollars.

Having 229 full time professors would put the student to faculty ratio at eight to one. One can apply this eight to one ratio to the increase of approximately 450 students to yield 56 extra full time faculty required. If the faculty averages 60 percent teaching and forty percent conducting research, then 93 additional faculty would be required to

accommodate the additional 450 students. Again, funding requirements would only be for 56 equivalent full time professors due to the availability of reimbursable research.

This thesis does not address the validity of maintaining an eight to one student/faculty ratio. If this ratio were increased, the requirement for 93 new faculty members would decrease and, correspondingly, the funding requirement for 56 equivalent full time faculty members would also decrease.

IV. ANALYSIS

A. AFIT AND NPS INPUTS

It is clear from the examination of both AFIT and NPS that both the Navy and the Air Force have a strong interest in their respective postgraduate schools. The Navy has committed itself to sending a higher percentage of its officers to NPS for Masters degrees than the Air Force sends to AFIT in residence. This commitment is also reflected in the offering of a wider variety of degrees at NPS. In addition to those curriculum that offer like degrees as AFIT, NPS has courses of study in National Security Affairs, Air-Ocean Sciences, Combat Systems Sciences and Technology, Joint Command, Control and Communications, Naval Engineering and, Undersea, Space and Electronic Warfare. The Air Force does send a larger contingent of officers to AFIT in the Doctoral program than the Navy sends to NPS for a Ph.D. This reflects the Air Force assessment of the importance of a doctoral education for its non-rated officers.

An important point left out in these enrollment numbers is the fact that while NPS can project what its enrollment numbers may be, no one can be sure that these projections will actually match reality. In an age of a shrinking military and

officer corps, it may be decided, for example, that instead of maintaining a stable population at NPS or AFIT, the number of students enrolling at both schools should be the same percentage of the overall officer end strength as is the case today. If this is the case than both schools may see a decline in enrollment and an increase in excess capacity.

AFIT has recently formed a consortium with two neighboring institutions, Wright State University and The University of Dayton. Students attending any of the three schools may take courses from one of the other schools which can be applied towards their degree requirements[Ref.6]. This consortium, called DAGSI (Dayton Area Graduate Studies Institute), is awaiting pending legislation to allow AFIT to fully participate in this project. NPS is also moving towards similar agreements with local institutions to allow for joint educational usage.

B. AFIT vs NPS COURSE COMPARISON

Of the twenty one programs offered at AFIT that are listed in Appendix A only Engineering and Environmental Management, and the Nuclear Engineering subspeciality of Physics are programs that would need a majority of their classes added to those already being taught at NPS in order to fulfill their requirements. In the case of Environmental Management this amounted to six new classes and a symposium. Nuclear Engineering also would require six new classes. All other

courses combined had 95 percent of classes that could be matched(Exhibit 4-1). This is a significant percentage given that the two schools were set up to provide unique courses for their respective services. It would seem that there is more duplication of services than past studies would have lead one to believe.

Again, this study looked at matching AFIT courses with NPS courses and not vice versa. NPS offers, on the average, more courses per degree and more unique degrees than AFIT. It is therefore unlikely that AFIT would be able to match the same percentage of courses taught at NPS than NPS can of those courses taught at AFIT.

In almost all cases where courses did not match, with the exception of the Environmental Management and Nuclear Engineering curricula, it was judged, by those professors interviewed, that adding courses to cover these areas would not require any major shift in course focus or significant budget items for developing a new course. Of course, if the two schools were to merge, professors with expertise and a course already in place at AFIT could start up a new course at NPS in minimal time.

An important point that was brought up in interviews with most NPS professors in comparing courses was that AFIT curriculum are structured so as to produce a graduate that specializes in one area. NPS curriculum offer a broader range of classes. Therefore, if NPS and AFIT were to consolidate,

the requirement for Air Force Officers to specialize would not go away. If the same AFIT course requirements were offered at NPS than former AFIT students would have a wider variety of classes with which to choose from in specializing. NPS students would also be able to take more specialized classes that would be offered as a result of Air Force requirements.

EXHIBIT 4-1 TOTAL NUMBER OF COURSES COMPARED AND MATCHED WITH AN EQUIVALENT NPS COURSE(S) FOR EACH DEGREE OFFERED AT AFIT

| <u>AFIT Program</u> | <u>Courses Compared</u> | <u>Courses Matched</u> |
|---|-------------------------|------------------------|
| Acquisition Logistics Management . . . | 18 | 18 |
| Aeronautical Engineering | 49 | 48 |
| Astronautical Engineering | 41 | 40 |
| Computer Engineering / Computer Systems | 38 | 35 |
| Contracting Management | 18 | 18 |
| Cost Analysis | 20 | 19 |
| Electrical Engineering | 71 | 65 |
| Environmental Engineering | 11 | 5 ¹ |
| Information Resource Management | 23 | 22 |
| Logistics Management | 20 | 20 |
| Applied Mathematics | 14 | 14 |
| Maintenance Management | 21 | 20 |
| Operational Analysis | 16 | 16 |
| Operations Research | 15 | 14 |
| Applied Physics | 30 | 21 ² |
| Software Systems Management | 21 | 20 |

| | | |
|---------------------------------------|------------|-----------------|
| Space Operations | 16 | 16 |
| Supply Management | 19 | 19 |
| Systems Engineering | 30 | 24 ³ |
| Systems Management | 17 | 17 |
| Transportation Management | <u>18</u> | <u>18</u> |
| Total Courses Compared/Matched | 491 | 454 |

¹No match for 6 ENVR courses

²No match for 6 NENG courses

³No match for 3 ENVR courses

Can one discern from these figures exactly how many extra sections of like courses would be required or how many new courses would be needed? The number of extra sections or new courses would depend on how a consolidation would take place. There are two basic scenarios for consolidation. The first is that all AFIT students transfer to NPS at the same time, regardless of how far they had progressed in their curriculum. The other is that all students already enrolled at AFIT be allowed to finish their degree there, and all new students begin their program at NPS.

The process of determining how many new courses would be required for each scenario would be the same. One would have to first decide which courses would be required for the transferring AFIT students and substitute the NPS course that matches the course for content. Unless course requirements for Air Force students were to change following a consolidation, any courses that couldn't be matched would

require a new course and a certain number of sections, depending on the total number of students required to take the course.

If only new students were sent to NPS and existing AFIT students were allowed to complete their education at AFIT the process would be the same. However, the initial number of new courses and sections required for all courses would be smaller, and would then build up gradually as more students enrolled.

The courses that would be offered for Ph.D. students were not compared in this thesis. Presumably, there would be a need for an increase in courses offered at NPS to accommodate the Ph.D. students from AFIT. These courses would also be available for select Masters students who had demonstrated superior performance in their respective field of endeavor.

C. EXCESS CAPACITY OF NPS

1. Classroom Availability

In reviewing Appendix B it appears that there is ample classroom space available at NPS to absorb 450 more students. This can be accomplished without having to schedule courses after the nine daily classroom scheduling periods. With approximately 200 extra scheduling periods available, being able to schedule 88 additional courses should not pose too great a problem. In scheduling the 1800 current students at NPS there are approximately 960 different student schedules

that need to be meshed into a nine period day, five day week. This process is being accomplished by two schedulers who work the last eight weeks of each quarter just to schedule the following quarter's classes.

Various scheduling problems exist. Students who have deviated from their curriculum schedule, either through validating classes and moving later classes forward, or having to retake a dropped class, or taking different electives, require unique schedules. A solution to this problem may be to only schedule students for their core courses and have them sign up separately for their electives or any other core courses which they may be taking early. This solution has its own problems in that students are at NPS for a set amount of time. Their respective Services cannot afford to have their time at NPS extended because they weren't able to schedule all of their courses. There are also certain blocks of time each week which must be set aside for Superintendent Guest Lecturers and other student/faculty meetings.

NPS has tried to develop a computer program whereby all one would have to do is input students schedules, classrooms available for instruction, and any professor preferences and the computer automatically formulates the next quarter's schedule. The scheduling, however, continues to be a manual process as a workable program has yet to be developed.

2. Laboratory Availability

As was stated in chapter 3 it was not possible for the author to match up labs between AFIT and NPS. This is an area that those with experience in each of the lab areas must examine by comparing both schools' facilities. It can be concluded that the labs at NPS have sufficient capacity to accommodate a large proportion of the AFIT students. While the spring quarter's data may not be indicative of average laboratory usage, the scheduling of classes with lab requirements could be adjusted to allow for an even usage of labs each quarter given the increase from a consolidation.

While AFIT does have Air Force Aerospace laboratory facilities that it uses for both student and faculty research, these do not appear to be essential requirements for obtaining a masters degree. The same degree can be earned without these labs although they do make it easier for students to conduct thesis research. This same experience may be gathered by sending Air Force students to these labs for six week experience tours as is done with NPS students in various curricula now.

3. Housing Availability

Housing 450 additional students and their families, if any, does not seem to be as great an issue with the closing of Fort Ord and NPS taking control of an additional 600 units, 470 of which will be available for NPS staff and students.

Having 1347 units available for approximately 1507 student families gives a coverage percentage of 89%. This is assuming that all those families would be requesting military housing. While it was stated that the percentage of people attending NPS who opted to live off base was not available, given this fact, the number of families requiring military housing would be less and the coverage factor higher.

As of January 1994 there were 3541 vacant units within a twenty mile radius of NPS and approximately 11,400 in all of Monterey County. A breakdown, however, wasn't available as to whether these units were apartments, condominiums or attached/detached homes. One would expect a fairly even split between them. Therefore, any student families should be able to find adequate housing be it military or civilian.

Currently there is a lack of space to accommodate all bachelors attending NPS who want to live in military housing. The Bachelor Officer's Quarters, located in Hermann Hall, is planning that within two to three years the Naval Aviation Safety School may move to other quarters at NPS. This move would free up two floors of Hermann Hall for more rooms. Currently, with only 41 rooms available, a large percentage of bachelors and geographic bachelors must reside off base.

D. FACULTY REQUIREMENTS

As indicated in Chapter III, approximately 93 new faculty positions would have to be created if AFIT students were

consolidated with NPS students. Yet, funding requirements were only needed to cover 56 full time professors as reimbursable funds could be expected to cover the other forty percent of their time spent conducting research. This is not to say that only 93 of AFIT's faculty would transfer to NPS. Obviously in a consolidation of this type an oversight committee would have to weigh course requirements for all students attending this "Defense Postgraduate School." From this analysis, faculty requirements would then be determined. Clearly, all available professors from both schools would be considered when forming a combined faculty.

The benefits of such a combined faculty would be tremendous not only for the military Services but for the entire Department of Defense. With the combined capabilities of both Engineering schools it may be easier to move towards uniformity in engineering standards for all Services. Joint research could also move the Services towards uniformity in areas like DoD accounting standards, computer standards, distance learning standards, and countless areas in weapons systems standards.

In researching this topic it was surprising to find out just how little these two schools' faculty interact with each other on a regular basis. There are one or two professors the author encountered that do interact regularly. But, on the whole, both schools have had too few joint academic projects. This may be due to both schools having different program

sponsors with different agendas for their programs. Both Services still have their own service specific way of conducting various operations which could be the main reason that there hasn't been many opportunities presented that would require joint participation of the two schools. A consolidated university would solve this problem.

In a consolidation there will probably be those professors who, for various reasons, would opt not to move if it was required of them. One would hope that the opportunities presented by a consolidation of these two schools would outweigh any reservations one would have towards such a consolidation. The bottom line is to provide the men and women of the U.S. Armed Services, DoD employees and International students the best possible education.

E. OTHER STUDIES

The other studies which analyzed the idea of consolidation, the 1978 study comparing AFIT and NPS programs and the 1994 study which looked at Consolidation of War and Staff colleges, bear mentioning. The 1978 ITRO study never considered the possibility of a total consolidation at either site. In consolidating only certain curricula the study found that, because of the interdisciplinary nature of the curricula examined, most courses would still need to be taught for curricula not consolidated. With a total consolidation this problem would cease to exist.

The 1978 study did little in the way of examining any real cost savings. If a total consolidation were to take effect, savings could occur in areas such as support staff, decreased maintenance costs for AFIT school and laboratory facilities, overhead costs with respect to lighting, heating, etc., and savings in faculty salaries.

The 1994 study, which considered consolidating various War and Staff colleges, determined that construction would be required in each instance to accommodate the increase in students, faculty, staff and other support personnel. Because of this lack of space, construction costs would not be recouped by any savings within the five year time period required by this study. One purpose of this thesis was to determine if NPS would require any major construction. This thesis did not find any requirement for major construction, thus eliminating the major cost found in other consolidation studies.

V. CONCLUSIONS

A. INTRODUCTION

Chapter I lists five questions that were the research objectives of this thesis. This chapter will revisit those questions to see what answers were found and what new questions were raised.

B. RESEARCH OBJECTIVES

1. Does NPS have excess capacity to accommodate AFIT's student population(classroom, housing, etc.)?

It would appear that there is ample capacity to accommodate the student population of AFIT at NPS. Classroom usage would indicate that any additional course requirements could be handled without having to undergo new construction. Enough housing now exists, with the acquisition of Fort Ord housing, to accommodate the families of students and military instructors that would come from AFIT. While ample government bachelor quarters do not exist to house all or a high percentage of bachelors that would be involved in a consolidation, enough off base housing exists to accommodate the increase.

2. Would additional faculty be required to handle this influx of students? If so, how many?

Additional faculty would be required to adequately instruct the influx of Masters and Ph.D. students a consolidation would bring. This research placed that number at 93 more faculty members that would be required in order to have 56 full-time equivalent teaching faculty members. A consolidation would require that an oversight committee look at all available instructors between the two schools, and any other qualified applicants, in order to achieve the total required number of faculty.

3. Are the facilities at NPS adequate to handle the additional research that would be expected from both the students and faculty brought to Monterey?

It is likely that the facilities at NPS and the surrounding area do not fully match those of the Air Force laboratories located on Wright Patterson AFB. However, there are ways to make up for this lack of Air Force laboratories. After a consolidation, with 40 percent of their time now spent conducting research, professors could perform this research at appropriate Air Force laboratories including those at Wright-Patterson AFB. In addition, AFIT students could, as some NPS students do, take six week experience tours at various sites including the labs at Wright Patterson AFB. One realizes that there would be added costs associated with this off-site arrangement.

4. Can NPS establish individual programs to satisfy Air Force requirements that are currently being met at AFIT?

As NPS has demonstrated with the Army's acquisition program at NPS, so too would it be possible to develop individual programs to satisfy Air Force requirements currently being met at AFIT. Service schools are unique in that they can be very responsive to the needs of program sponsors. Various Air Force commands could become sponsors of any special curricula that may need to be established if a consolidation were to occur. This would ensure, as it has done for the Army, that the Service's needs are being met. NPS currently is matching 92 percent of AFIT courses in similar courses already being taught at NPS. Any new courses that would have to be generated at NPS could be done easily by AFIT professors who are already teaching these classes.

Adding these additional Masters and Ph.D. courses would enhance the education received by both current and future NPS students (Air Force Officers included). NPS could establish itself as the premier site for military postgraduate education and joint military/civilian research.

5. What are the cost implications for NPS from this consolidation?

This was a question that requires additional data in order to adequately answer.

C. FURTHER RESEARCH AREAS

1. One area that would require closer scrutiny if a consolidation was being proposed is NPS laboratories excess

capacity and their ability to accommodate specific AFIT laboratories. If any specific laboratory equipment would be required to be moved from AFIT to NPS would the facilities at NPS be adequate enough to house this equipment.

2. A full costing survey would be needed to look at costs associated with moving the entire AFIT program to NPS. While previous studies have considered only specific programs, none have looked at costs involving moving all programs.

3. AFIT might also be considered as a possible site for a combined DoD postgraduate university. Therefore, a full costing survey should be completed to look at costs associated with moving the entire NPS program to AFIT.

4. In considering making NPS the sole site for a DoD postgraduate university, along with a full costing survey, a qualitative study of making NPS the sole site for a DoD postgraduate university should be completed. This study would take into account any factors a costing survey would omit.

5. Any consideration of consolidating should include all sites being proposed. Therefore, a qualitative study of making AFIT the sole site for a DoD postgraduate university should also be completed.

D. CONCLUSION

This is a topic that is very sensitive to both the Navy and Air Force. Both schools are meeting their Service's needs and any consideration of consolidating should be carefully

scrutinized. Any serious consolidation proposals would move this issue into a full analysis of those areas that are specific Service responsibilities and those in which interservice and joint training more effectively meet the needs of the nation. This thesis does not conclude that AFIT should be moved to NPS. Hopefully this thesis will be used as a tool to start discussion between the two schools concerning a possible consolidation.

The decision to establish a single DoD Postgraduate university should be an easy choice. It offers the opportunity to not only reduce overall costs, but also a chance to create a premier teaching and research facility dedicated to producing a better educated Officer to help lead the United States military into the twenty first century.

APPENDIX A - AFIT COURSE COMPARISON

1. Acquisition Logistics Management

| AFIT ACQUISITION LOGISTICS MANAGEMENT | | NPS EQUIVALENT COURSE | |
|---------------------------------------|---|-----------------------|--|
| AMGT 336 | Principles in Financial Accounting | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| QMGT 290 | Introduction to AFIT Computer Systems | IS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| LOGM 614 | Acquisition Logistics Overview | MN 4310 | Logistics Engineering |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |

| | | | |
|----------|--|---------|--|
| QMGT 575 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| AMGT 601 | Governmental Accounting / Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| LOGM 569 | Maintenance and Production Management | MN 3374 | Production Management: A TQM/L Perspective |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Simulation Modeling for Managerial Decision Making |
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |
| LOGM 510 | Information Support for Managers | IS 3183 | Management Information Systems |
| AMGT 559 | Life Cycle Cost and Reliability | MN 4310 | Logistics Engineering |

2. Aeronautical Engineering

| AFIT AERONAUTICAL ENGINEERING | | NPS EQUIVALENT COURSE | |
|--------------------------------------|--|------------------------------|--|
| AERO 535 | Low Speed Aerodynamics | AA 3501 | Aerodynamic Analysis |
| AERO 536 | High Speed Aerodynamics | AA 4502 | High-Speed Aerodynamics |
| MECH 528 | Aircraft Stability | AA 3340 | Flight Dynamics |
| MECH 423 | Dynamics of Aerospace Systems | ME 2502 | Dynamics |
| MECH 444 | Analysis of Structural Systems | AA 2820 | Spacecraft Structures |
| MENG 431 | Propulsion | ME 3240 | Reciprocating and Gas Turbine Power Plants |
| MATH 511 | Methods of Applied Mathematics I | MA 2049 | Vector Analysis with Applications |
| MATH 513 | Methods of Applied Mathematics II | MA 3675 | Theory of Functions of a Complex Variable |
| | | MA 3132 | Partial Differential Equations and Integral Transforms |
| | FLUID MECHANICS/ AERODYNAMICS SEQUENCES | | |
| AERO 725 | High Lift Aerodynamics | AA 4305 | V/STOL Aircraft Technology |
| AERO 612 | Perturbation Methods in Aircraft Aerodynamics | AA 4502 | High-Speed Aerodynamics |
| AERO 636 | Aerodynamics of Wings and Bodies | AA 3501 | Aerodynamic Analysis |
| AERO 622 | Introductory Hypersonics | AA 4844 | Hypersonic Flight |

| | | | |
|----------|--|---------|--|
| AERO 729 | Physical Gas Dynamics | AA 4506 | Rarefied Gas Dynamics |
| AERO 624 | Advanced Hypersonics | AA 4844 | Hypersonic Flight |
| AERO 520 | Viscous Flow Theory | AA 2042 | Fundamentals of Thermo and Fluid Dynamics |
| MENG 674 | Convection Heat Transfer | ME 4162 | Convection Heat Transfer |
| MENG 673 | Radiation Heat Transfer | ME 4163 | Radiation Heat Transfer |
| MENG 732 | Advanced Turbomachinery | ME 3240 | Reciprocating and Gas Turbine Power Plants |
| MENG 733 | Airbreathing Engine Design | AA 4451 | Aircraft Engine Design |
| MENG 634 | Hypersonic Airbreathing Propulsion | AA 4844 | Hypersonic Flight |
| MENG 530 | Chemical Rocket Propulsion | AA 3851 | Spacecraft Propulsion |
| AERO 827 | Turbulent Flow | ME 4220 | Viscous Flow |
| AERO 752 | Computational Aerodynamics | AA 4507 | Computational Fluid Dynamics and Heat Transfer |
| AERO 753 | Advanced Computational Aerodynamics | AA 4507 | Computational Fluid Dynamics and Heat Transfer |
| | SOLID MECHANICS SEQUENCES | | |
| MECH 600 | Elasticity I | ME 4612 | Advanced Mechanics of Solids |
| MECH 642 | Finite Element Methods for Structural Analysis I | ME 3440 | Engineering Analysis |

| | | | |
|----------|---|---------|--|
| MECH 644 | Finite Element Methods for Structural Analysis II | ME 4613 | Finite Element Methods |
| MECH 515 | Theory of Vibrations | ME 3521 | Mechanical Vibration |
| MECH 610 | Structural Vibrations | ME 4620 | Theory of Continuous Media |
| MECH 711 | Structural Damping | PH 3458 | Noise Shock and Vibration Control |
| AERO 636 | Aerodynamics of Wings and Bodies | AA 3501 | Aerodynamic Analysis |
| MECH 662 | Introduction to Aeroelasticity | AA 4318 | Aeroelasticity |
| MECH 541 | Mechanics of Composite Materials | MS 4822 | The Engineering and Science of Composite Materials |
| MECH 605 | Fracture Mechanics | MS 3202 | Properties Problems and Failure of Materials |
| MECH 701 | Inelastic Material Behavior | ME 4612 | Advanced Mechanics of Solids |
| | FLIGHT MECHANICS AND SYSTEMS SEQUENCES | | |
| MECH 556 | Optimal Performance I | AA 3701 | Missile Aerodynamics |
| | | AA 4703 | Missile Flight Analysis |
| MECH 628 | Aircraft Control | AA 3340 | Flight Dynamics |
| MECH 728 | Advanced Flight Mechanics | AA 4342 | Advanced Control for Aerospace Systems |
| MECH 622 | Functional Optimization and Optimal Control | AA 3341 | Aerospace Controls |

| | | | |
|----------|-------------------------------------|---------|--|
| SENG 665 | Multivariable Control Theory | ME 4811 | Modern Control Systems |
| MECH 623 | Advanced Functional Optimization I | AA 4342 | Advanced Control for Aerospace Systems |
| SENG 564 | Conventional Weapons Effects | PH 4858 | Weapons Lethality and Survivability |
| NENG 590 | Nuclear Weapons Physics | PH 4856 | Physics of Nuclear Weapons |
| STAT 687 | Mathematics of Reliability Theory I | AA 4201 | Reliability Engineering and System Safety Management |
| SENG 685 | Reliability Engineering | AA 4201 | Reliability Engineering and System Safety Management |
| SENG 687 | Advanced Topics in Reliability | | No Match |
| MECH 720 | Analytical Mechanics I | ME 4821 | Advanced Dynamics |
| MECH 723 | Advanced Robotics | CS 4313 | Advanced Robotics Systems |
| MECH 725 | Man-in-the Loop Control | CS 4310 | Artificial Intelligence Techniques for Military Applications |

3. Astronautical Engineering

| AFIT | ASTRONAUTICAL ENGINEERING | NPS | EQUIVALENT COURSE |
|----------|--|---------|---|
| MECH 423 | Dynamics of Aerospace Systems | ME 2502 | Dynamics |
| SENG 525 | Linear Systems Analysis | EC 2420 | Linear Systems |
| SENG 565 | Control and State Space Concepts | EC 2300 | Control Systems |
| MECH 532 | Fundamentals of Astrodynamics | PH 2511 | Orbital Mechanics |
| MECH 533 | Problems in Space Flight | AA 3815 | Space Dynamics |
| PHYS 521 | Space Surveillance | SS 3525 | Remote Sensing |
| EENG 421 | Space Communication Systems | EC 2500 | Communications Theory |
| MECH 444 | Analysis of Structural Elements | AA 2820 | Spacecraft Structures |
| MENG 530 | Chemical Rocket Propulsion | AA 3851 | Spacecraft Propulsion |
| | GUIDANCE AND CONTROL SEQUENCE | | |
| MECH 518 | Dynamics of Space Structures | AE 3815 | Spacecraft Dynamics |
| SENG 665 | Multivariable Control Theory | ME 4811 | Modern Control Systems |
| MECH 722 | Control of Flexible Spacecraft | AA 4816 | Dynamics of Flexible Space Structures |
| MECH 720 | Analytical Mechanics | ME 4821 | Advanced Dynamics |
| MECH 723 | Advanced Robotics | CS 4313 | Advanced Robotics Systems |

| | | | |
|----------|---|---------|--|
| MECH 725 | Man-in-the-Loop Control | CS 4310 | Advanced Artificial Intelligence |
| MECH 636 | Advanced Astrodynamics | MA 4362 | Orbital Mechanics |
| MECH 731 | Modern Methods in Orbit Determination | MA 4362 | Orbital Mechanics |
| | INSTRUMENTATION SEQUENCE | | |
| EENG 534 | Fundamentals of Aerospace Components & Systems | AA 4341 | Aerospace Controls |
| EENG 660 | Feedback Systems II | EC 2300 | Control Systems |
| EENG 635 | Inertial Guidance & Control of Aerospace Vehicles | AA 4341 | Aerospace Controls |
| EENG 735 | Navigation Systems Analysis and Integration | AA 4342 | Advanced Control for Aerospace Systems |
| | ROCKET PROPULSION SEQUENCE | | |
| MENG 530 | Chemical Rocket Propulsion | AA 3851 | Spacecraft Propulsion |
| MENG 630 | Fluid Mechanics of Rockets | ME 3201 | Intermediate Fluid Dynamics |
| MENG 632 | Nonchemical Propulsion | AA 3451 | Military Aircraft and Missile Propulsion |
| MENG 631 | Solid Rocket Propulsion | AA 4452 | Tactical Missile Propulsion |
| | STRUCTURAL SEQUENCES | | |
| MECH 600 | Elasticity | ME 4612 | Advanced Mechanics of Solids |

| | | | |
|----------|---|--------------------|---|
| MECH 642 | Finite Element Methods for Structural Analysis I | ME 3440 | Engineering Analysis |
| MECH 644 | Finite Element Methods for Structural Analysis II | ME 4613 | Finite Element Methods |
| MECH 515 | Theory of Vibration | ME 3521 | Mechanical Vibration |
| MECH 610 | Structural Vibrations | ME 4620 | Theory of Continuous Media |
| MECH 711 | Structural Damping | PH 3458 | Noise Shock and Vibration Control |
| | REENTRY AERODYNAMICS SEQUENCE | | |
| AERO 520 | Viscous Flow Theory | AA 2042 AA 3501 | Fundamentals of Thermo and Fluid Dynamics Aerodynamic Analysis |
| AERO 622 | Introductory Hypersonics | AA 4844 | Hypersonic Flight |
| AERO 729 | Physical Gas Dynamics | AA 4506 | Rarefied Gas Dynamics |
| | SPACE FACILITIES SPECIALTY SEQUENCE | | |
| MENG 530 | Chemical Rocket Propulsion | AA 3851 | Spacecraft Propulsion |
| MECH 518 | Dynamics of Space Structure | AA 3815 | Introduction to Spacecraft Dynamics |
| MENG 532 | Space Power Systems | EO 3740 | Space Power |
| SENG 520 | Systems Analysis for Design | ME 2801 | Introduction to Engineering Systems Dynamics |
| SENG 585 | Reliability in System Design | | No Match |

| | | | |
|----------|---|---------|---|
| AMGT 559 | Life Cycle Cost and Reliability | MN 4310 | Logistics Engineering |
| CMGT 523 | Contract and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |

4. Contracting Management

| AFIT | CONTRACTING MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|---|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| QMGT 290 | Introduction to AFIT Computers | IS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| LOGM 510 | Information Support for Managers | IS 3183 | Information Systems Management |
| CMGT 520 | Systems Contracting Management | MN 4301 | Contracting for Major Systems |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |

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|----------|--|---------|---|
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| CMGT 552 | Seminar in Contract Management | MN 3305 | Contract Administration |
| SMGT 643 | Systems Acquisition Management | MN 3301 | Systems Acquisition and Project Management |
| CMGT 550 | Systems Production Management | MN 4307 | Program Management Policy and Control |
| AMGT 601 | Government Accounting and Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| LAWS 550 | Legal Principles / Government Contracting | MN 3312 | Contract Law |
| CMGT 654 | Seminar in Acquisition Management | MN 4371 | Acquisition and Contracting Theory |

5. Cost Analysis

| AFIT | COST ANALYSIS | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| QMGT 290 | Introduction to AFIT Computers | IS 0123 | Computer Skills Development |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| QMGT 670 | Statistics for Cost Analysis | OS 3101 | Statistical Analysis for Management |
| AMGT 600 | Managerial Accounting | MN 3161 | Management Accounting |
| QMGT 671 | Defense Cost Modeling | OA 4702 | Cost Estimation |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |
| IMGT 677 | Quantitative Management of Software | OA 4702 | Cost Estimation |
| COST 673 | Cost Estimation for Weapons Systems Production | OA 4702 | Cost Estimation |
| QMGT 660 | Project Risk Analysis | | No Match |

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|----------|---------------------------------|---------|--|
| QMGT 672 | Model Diagnostics | MN 4163 | Analytical Techniques for Financial Control and Planning |
| AMGT 559 | Life Cycle Cost and Reliability | MN 4310 | Logistics Engineering |
| SMGT 647 | Acquisition Strategy | MN 4301 | Contracting for Major Systems |
| | | MN 4371 | Acquisition and Contracting Policy |
| AMGT 602 | Federal Financial Management | MN 3172 | Public Policy and Budgeting |
| SMGT 643 | Systems Acquisition Management | MN 3301 | Systems Acquisition and Program Management |
| SMGT 646 | Project Management | MN 4307 | Program Management Policy and Control |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| LOGM 630 | Forecasting Management | MN 3372 | Material Logistics |

6. Computer Engineering / Computer Systems

| AFIT | COMPUTER ENGINEERING / COMPUTER SYSTEMS | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| CSCE 431 | Introduction to Discrete Mathematics | MA 3026 | Discrete Mathematics with Applications |
| CSCE 486 | Introduction to Data Structures and Program Design | CS 3300 | Data Structures |
| CSCE 488 | Introduction to Logic Design | CS 3010 | Computer Systems Principles |
| AMGT 553 | Software Project Management | IS 4300 | Software Engineering and Management |
| CSCE 586 | Advanced Information Structures | CS 3300 | Data Structures |
| CSCE 588 | Computer Systems Architecture | CS 3200 | Computer Architecture |
| CSCE 589 | Operating Systems | CS 3450 | Operating Systems |
| CSCE 594 | Software Analysis and Design II | CS 4114 | Advanced Topics in Object Oriented Programming |
| CSCE 595 | Software Generation and Maintenance | CS 4500 | Software Engineering |
| CSCE 687 | Advanced Microprocessor Design Laboratory | EC 3800 | Microprocessor Based System Design |
| CSCE 692 | Design Principles of Computer Architecture | EC 3840 | Introduction to Computer Architecture |
| CSCE 531 | Advanced Mathematics for Computer Science | MA 2025 | Bridge to Advanced Mathematics |

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|----------|---|---------|--|
| CSCE 532 | Automata and Formal Language Theory | CS 3601 | Theory of Formal Languages and Automata |
| CSCE 544 | Data Security | CS 4601 | Computer Security |
| CSCE 631 | Mathematics for Computer Hardware and Software Design | | No Match |
| CSCE 647 | Queuing in Computer Systems | CS 4112 | Distributed Operating Systems |
| CSCE 663 | Compiler Theory and Implementation | CS 3113 | Introduction to Compiler Writing |
| CSCE 686 | Advanced Algorithm Design | CS 3650 | Design and Analysis of Algorithms |
| CSCE 756 | Logic Programming | | No Match |
| CSCE 786 | Mathematical Theory of Computation | CS 3601 | Theory of Formal Languages and Automata |
| CSCE 792 | Parallel Computer Architecture | CS 4451 | Design and Analysis of Multiple-Processor, Real-Time Computers |
| EENG 653 | Introduction to VLSI Design | EC 4780 | VLSI Systems Design |
| EENG 695 | VLSI Systems Design | EC 4870 | VLSI Systems Design |
| EENG 795 | Advanced Topics in VLSI Systems | EC 4900 | Special Topics in Electrical Engineering |
| CSCE 593 | Software Analysis and Design I | CS 3460 | Software Methodology |
| CSCE 594 | Software Analysis and Design II | CS 4114 | Advanced Topics in Object Oriented Programming |
| CSCE 693 | Principles of Embedded Software | | No Match |

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|----------|---|---------|--|
| CSCE 793 | Formal-Based Methods in Software Engineering | CS 4500 | Software Engineering |
| CSCE 546 | Introduction to Computer Database Systems | CS 3320 | Database Systems |
| CSCE 646 | Database Design and Implementation | CS 3320 | Database Systems |
| CSCE 582 | Interactive Computer Graphics | CS 4202 | Computer Graphics |
| CSCE 682 | Raster Graphics | CS 4202 | Computer Graphics |
| MATH 521 | Applied Linear Algebra | MA 3046 | Matrix Theory and Computational Linear Algebra |
| MATH 600 | Mathematical Analysis | MA 3605 | Fundamentals of Analysis I |
| MATH 674 | Numerical Analysis I | MA 3232 | Numerical Analysis |
| CSCE 523 | Artificial Intelligence | CS 3310 | Artificial Intelligence |
| CSCE 623 | Artificial Intelligence Systems Design | CS 4310 | Artificial Intelligence Techniques for Military Applications |
| CSCE 624 | Knowledge-Based Systems | CS 4311 | Expert Systems |

7. Electrical Engineering

| AFIT | ELECTRICAL ENGINEERING | NPS | EQUIVALENT COURSE |
|----------|---|--------------------|---|
| EENG 665 | Random Signal and System Analysis | EC 3410 EC 3500 | Discrete-Time Random Processes Analysis of Random Signals |
| EENG 669 | Digital Communications I | EC 3510 | Communications Engineering |
| EENG 670 | Digital Communications II | EC 4550 | Digital Communication |
| EENG 671 | Statistical Communications Theory | EC 4570 EC 4580 | Decision and Estimation Theory Information Theory |
| EENG 535 | Radar Systems Analysis | EC 3670 | Principles of Radar Systems |
| EENG 666 | Detection and Estimation Theory | EC 4570 | Adaptive Signal Processing |
| EENG 668 | Advanced Radar Systems Analysis | EC 4610 | Radar Systems |
| EENG 691 | Digital Signal Processing | EC 3400 | Digital Signal Processing |
| EENG 548 | Human Factors Engineering | OA 3401 OA 3402 | Human Factors in Systems Design I Human Factors in Systems Design II |
| CSCE 554 | Computer Communications Networks | CS 3502 | Computer Communications and Networks |
| CSCE 588 | Computer Architecture | CS 3200 | Computer Architecture |
| STAT 605 | Probability Theory for Communications and Control | OA 3101 | Probability |

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|----------|---|---------|---|
| EENG 580 | Computational Methods for Discrete Linear Systems | EC 2400 | Discrete Systems |
| EENG 680 | Introduction to Signal Processing | EC 3400 | Digital Sound Processing |
| EENG 681 | Digital Filter Design | EC 3400 | Digital Sound Processing |
| EENG 682 | Statistical Signal Processing | EC 3420 | Statistical Digital Signal Processing |
| EENG 515 | Linear Systems, Fourier Transforms and Optics | EC 3210 | Introduction to Electro-Optical Engineering |
| EENG 527 | Introduction to Fourier Optics | PH 3252 | Electro-Optics |
| EENG 672 | Statistical Optics | EC 4900 | Special Topics in Electrical Engineering |
| EENG 715 | Advanced Topics in Optical Information Processing | EC 4900 | Special Topics in Electrical Engineering |
| EENG 524 | Electromagnetic Waves I | EC 2600 | Intro to Fields and Waves |
| EENG 576 | Microwave Circuits | EC 3610 | Microwave Circuits |
| EENG 607 | Lightning and EMP | EC 1660 | High Frequency Techniques |
| EENG 625 | Antennas | EC 2600 | Electromagnetic Radiation Scattering and Propagation |
| EENG 628 | Electromagnetic Waves II | EC 2610 | Electromagnetic Engineering |
| EENG 630 | Electromagnetic Radiation and Scattering | EC 3600 | Electromagnetic Radiation, Scattering and Propagation |

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|----------|--|---------|--|
| EENG 725 | Advanced Electromagnetic Field Theory I | EC 4600 | Advanced Electromagnetic Theory |
| EENG 726 | Advanced Electromagnetic Field Theory II | EC 4600 | Advanced Electromagnetic Theory |
| EENG 629 | Electronic Warfare I | EC 4670 | Electronic Warfare |
| EENG 627 | RCS Analysis, Measurement, and Reduction | EC 4630 | RCS Prediction and Reduction |
| MATH 504 | Differential Equations of Mathematical Physics | PH 3991 | Physics of Oscillations and Waves |
| MATH 506 | Applied Partial Differential Equations | MA 3132 | Partial Differential Equations and Integral Transforms |
| MATH 512 | Mathematical Methods of Scattering | EC 4600 | Advanced Electromagnetic Theory |
| PHYS 541 | Fundamentals of Optics I | PH 3292 | Optics and Optoelectrics |
| PHYS 520 | Fundamental Lasers | PH 4283 | Laser Physics |
| PHYS 543 | Fundamentals of Optics II | PH 3292 | Optics and Optoelectrics |
| PHYS 544 | Fundamentals of Optics III | PH 3252 | Electro-optics |
| EENG 660 | Feedback Systems II | SE 3015 | Applied Physics Laboratory IV: Systems Control |
| EENG 662 | Optical Feedback Control | EC 3310 | Linear Optimal Estimation and Control |
| EENG 708 | Design of Linear Multivariate Feedback Systems | EC 4320 | Design of Linear Control Systems |

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|----------|--|---------|---|
| EENG 742 | Synthesis of Optimal Control Systems | EC 3310 | Linear Optimal Estimation and Control |
| EENG 765 | Stochastic Estimation and Control I | EC 3420 | Statistical Digital Signal Processing |
| EENG 766 | Stochastic Estimation and Control II | EC 4330 | Navigation, Missile, and Avionics Systems |
| EENG 768 | Stochastic Estimation and Control III | EC 4340 | Navigation, Missile and Avionics systems |
| EENG 665 | Discrete-Data Control Systems | EC 3500 | Analysis of Random Signals |
| | | EC 3410 | Discrete-Time Random Processes |
| EENG 664 | Digital Control Systems | SE 2014 | Applied Physics Laboratory II: Digital Techniques |
| EENG 712 | Linear Estimation and Control | EC 3410 | Discrete-Time Random Processes |
| | | EC 3310 | Linear Optimal Estimation and Control |
| EENG 534 | Fundamentals of Aerospace Instruments & Navigation Systems | | No Match |
| EENG 737 | Digital Methods of Aerospace Guidance | PH 2511 | Introduction to Orbital Mechanics |
| | | AA 3815 | Introduction to Spacecraft Dynamics |
| | | AA 4818 | Spacecraft Attitude, Dynamics and Control |
| EENG 738 | Digital Avionics Fire Control | | No Match |

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|----------|---|---------|--|
| MECH 529 | Dynamics and Control of Flight Vehicles | ME 4821 | Advanced Dynamics |
| EENG 640 | Automatic Flight Control I | AA 2339 | Aerospace System Dynamics |
| EENG 641 | Automatic Flight Control II | AA 4341 | Aerospace Controls |
| EENG 635 | Inertial Navigation Subsystems | AA 4341 | Aerospace Controls |
| EENG 735 | Navigation Systems Analysis and Synthesis | EC 4330 | Navigation, Missile and Avionics Systems |
| CSCE 589 | Operating Systems | CS 3450 | Operating Systems |
| CSCE 593 | Software Analysis and Design | CS 3460 | Software Methodology |
| PHYS 570 | Physics of Solid State Devices | PH 4760 | Solid State Physics |
| EENG 576 | Microwave Circuits | EC 3610 | Microwave Circuits |
| EENG 596 | Integrated Circuit Technology | | NO MATCH |
| EENG 675 | Semiconductor Device Technology | EC 2200 | Electronics Engineering I |
| | | EC 2210 | Electronics Engineering II |
| EENG 676 | Microwave Electronic Devices | EC 3620 | Microwave Devices |
| EENG 695 | VLSI Design | EC 4870 | VLSI Systems Design |
| EENG 795 | Advanced Topics in VLSI Design | EC 4900 | Special topics in Electrical Engineering |
| EENG 653 | Introduction to VLSI Design | EC 4870 | VLSI Systems Design |
| CSCE 523 | Artificial Intelligence | CS 3310 | Artificial Intelligence |

| | | | |
|----------|--|---------|--|
| CSCE 623 | Artificial Intelligence Systems Design | CS 4310 | Advanced Artificial Intelligence |
| CSCE 624 | Knowledge Based Systems | CS 4311 | Expert Systems |
| EENG 620 | Pattern Recognition I | | NO MATCH |
| EENG 621 | Pattern Recognition II | | NO MATCH |
| EENG 817 | Advanced Topics in Pattern Recognition | | NO MATCH |

8. Environmental Engineering

| AFIT | ENVIRONMENTAL ENGINEERING | NPS | EQUIVALENT COURSE |
|----------|---|---------|---|
| ENVR 510 | US Environmental Law and Policy | | No Match |
| ENVR 520 | Environmental Systems Engineering | | No Match |
| ENVR 530 | Environmental Risk Analysis | | No Match |
| ENVR 550 | Pollution Prevention / Hazardous Waste Management | | No Match |
| CMGT 524 | Contracting for Engineers | MN 3371 | Contracts Management and Administration |
| ENVR 655 | Capstone Seminar in Engineering and Environmental Management | | No Match |
| LOGM 510 | Information Support for Managers | IS 3183 | Management Information Systems |
| ORSC 542 | Management and Behavior in Organizations Theory | MN 3105 | Organization and Management |
| STAT 526 | Managerial Statistics I | OS 3105 | Statistical Analysis for Management |
| OPER 562 | Introduction to Management Science | OS 3106 | Operations Research for Management |
| ENVR 500 | Engineering and Environmental Management Symposium | | No Match |

9. Information Resource Management

| AFIT | INFORMATION RESOURCE MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|---|---------|---|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| IMGT 290 | Introduction to Computing Technologies | IS 2000 | Introduction to Computer Management |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| IMGT 630 | Conceptual Foundations for Information Systems | IS 3183 | Management Information Systems |
| IMGT 657 | Data Communication for Managers | IS 4502 | Telecommunication Networks |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| IMGT 510 | Problem Solving and Structured Programming | CS 2970 | Structured Programming with ADA |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| OPER 526 | Quantitative Decision Making | OS 3004 | Operations Research for Computer Systems Management |

| | | | |
|----------|--|---------|---|
| IMGT 560 | Computer System Concepts | IS 3000 | Distributed Computer Systems |
| IMGT 651 | Systems Analysis and Design | IS 4200 | Systems Analysis and Design |
| IMGT 658 | Local Area Networks | IS 3502 | Computer Networks: Wide Area/Local Area |
| IMGT 561 | Database Management Systems | IS 4183 | Applications of Database Management Systems |
| LOGM 592 | Artificial Intelligence Applications in Management | IS 4186 | Introduction to Knowledge-Based Systems and Artificial Intelligence |
| ORSC 616 | Human Factors in Air Force Systems | | No Match |
| AMGT 601 | Government Accounting and Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| IMGT 540 | Information Engineering | IS 3171 | Economic Evaluation of Information Systems II |
| IMGT 654 | Information Systems Policy | IS 4182 | Information Systems Management |
| AMGT 520 | Managerial Economics I | MN 3140 | Microeconomic Theory |
| ORSC 626 | Organizational Development | MN 4125 | Managing Planned Change in Complex Organizations |

10. Logistics Management

| AFIT | LOGISTICS MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|---|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| QMGT 290 | Introduction to AFIT Computers | IS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Simulation Modeling for Managerial Decision Making |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |

| | | | |
|----------|--|--------------------|---|
| AMGT 601 | Government Accounting and Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |
| LOGM 569 | Maintenance and Production Management | MN 3374 | Production Management: A TQM/L Perspective |
| LOGM 510 | Information Support for Managers | IS 3183 | Management Information Systems |
| AMGT 520 | Managerial Economics I | MN 3140 | Microeconomic Theory |
| LOGM 609 | Quality Control Management | OS 3302 | Quality Assurance and Reliability Methods |
| LOGM 570 | Principles of Inventory Systems for Non-Supply Officers | MN 3377 | Inventory Management |
| LOGM 631 | Scheduling Theory and Application | MN 3372 MN 3374 | Material Logistics Production Management: A TQM/L Perspective |
| LOGM 636 | Service Operations Management | MN 3374 | Production Management: A TQM/L Perspective |

11. Applied Mathematics

| AFIT | APPLIED MATHEMATICS | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| MATH 600 | Mathematical Analysis | MA 3605 | Fundamentals of Analysis I |
| MATH 601 | Complex Analysis | MA 3606 | Fundamentals of Analysis II |
| MATH 621 | Linear Algebra | MA 3042 | Linear Algebra |
| STAT 527 | Introduction to Probability | OA 3101 | Probability |
| STAT 537 | Introduction to Statistics | OA 3103 | Statistics |
| STAT 696 | Applied General Linear Models | MA 3301 | Linear Programming |
| MATH 607 | Calculus of Variations | MA 3110 | Intermediate Analysis |
| MATH 609 | Integral Transform Theory | MA 3132 | Partial Differential Equations and Integral Transforms |
| STAT 687 | Mathematics of Reliability Theory I | OA 4303 | Sample Inspection and Quality Analysis |
| STAT 697 | Mathematics of Reliability Theory II | OA 4302 | Reliability and Weapons System Effectiveness |
| STAT 698 | Stochastic Processes | OA 4306 | Stochastic Processes I |
| MATH 674 | Numerical Analysis I | MA 3232 | Numerical Analysis |
| MATH 676 | Numerical Analysis II | MA 3243 | Numerical Methods for Partial Differential Equations |
| MATH 678 | Finite Element Techniques in Applied Science | MA 4245 | Finite Element Methods |

12. Maintenance Management

| AFIT | MAINTENANCE MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| QMGT 290 | Introduction to AFIT Computers | IS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| AMGT 601 | Government Accounting and Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research for Management |

| | | | |
|----------|--|--------------------|--|
| LOGM 569 | Maintenance and Production Management | MN 3374 | Production Management: A TQM/L Perspective |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Simulation Modeling for Managerial Decision Making |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| LOGM 510 | Information Support for Managers | IS 3183 | Management Information Systems |
| LOGM 609 | Quality Control Management | OS 3302 | Quality Assurance and Reliability Methods |
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |
| SMGT 643 | Systems Acquisition Management | Mn 3301 | Systems Acquisition and Project Management |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| AMGT 620 | Macroeconomics and Public Policy | MN 4145 | Policy Analysis |
| LOGM 631 | Scheduling: Theory and Application | MN 3372 MN 3374 | Material Logistics Production Management: A TQM/L Perspective |
| LOGM 637 | Theory of Constraints | | No Match |

13. Operational Analysis

| AFIT | OPERATIONAL ANALYSIS | NPS | EQUIVALENT COURSE |
|----------|--------------------------------------|--------------------|--|
| MATH 503 | Mathematical Methods | MA 3110 | Intermediate Analysis |
| MATH 507 | Numerical Methods | MA 3046 | Matrix Theory and Computational Linear Algebra |
| STAT 527 | Introduction to Probability | OA 3101 | Probability |
| STAT 537 | Introduction to Statistics | OA 3103 | Statistics |
| STAT 696 | Applied General Linear Methods | MA 3301 | Linear Programming |
| OPER 510 | Deterministic Operations Research | OS 3008 | Analytical Planning Methodology |
| OPER 520 | Probabilistic Operations Research | OA 3301 OA 4301 | Stochastic Models I Stochastic Models II |
| OPER 610 | Linear Programming and Network Flows | OA 3201 | Linear Programming |
| OPER 634 | Applied Linear Models | OA 4102 | Regression Analysis |
| OPER 666 | Military Systems Simulation | OA 3302 | OA System Simulation |
| OPER 595 | Issues in Operational Analysis | OA 2910 | Selected Topics in Operational Analysis |
| OPER 702 | Modeling Transportation Systems | MN 4376 | Defense Transportation System |

| | | | |
|----------|--|---------|---|
| EENG 574 | Introduction to Communications, Command and Control and Principles of Electronic Warfare | EC 4670 | Electronic Warfare |
| | | EC 4680 | Electronic Warfare Techniques and Systems |
| NENG 590 | Weapons Physics | PH 3855 | Nuclear Physics |
| NENG 596 | Nuclear Weapons Effects | PH 4856 | Physics of Nuclear Weapons |
| SENG 564 | Conventional Weapons Effects | PH 4858 | Weapons Lethality and Survivability |

14. Operations Research

| AFIT | OPERATIONS RESEARCH | NPS | EQUIVALENT COURSE |
|----------|--|--------------------|--|
| MATH 503 | Mathematical Methods for Operational Science | MA 3110 | Intermediate Analysis |
| MATH 507 | Numerical Methods for O.R. | MA 3046 | Matrix Theory and Computational Linear Algebra |
| STAT 527 | Introduction to Probability | OA 3101 | Probability |
| STAT 537 | Introduction to Statistics | OA 3103 | Statistics |
| STAT 696 | Applied General Linear Models | MA 3301 | Linear Programming |
| OPER 634 | Applied Linear Models | OA 4102 | Regression Analysis |
| COMM 685 | Communications for Managers & Analysis | | No Match |
| OPER 742 | Analysis for Defense Decisions | OA 4601 | Decision Analysis |
| OPER 398 | Research Methods | OA 2900 | Workshop in Operations Research/Systems Analysis |
| OPER 510 | Deterministic Operations Research | OS 3008 | Analytical Planning Methodology |
| OPER 520 | Probabilistic Operations Research | OA 3301 OA 4301 | Stochastic Models I Stochastic Models II |
| OPER 610 | Linear Programming and Network Flows | OA 3201 | Linear Programming |
| OPER 666 | Military Systems Simulation | OA 3302 | OA System Simulation |

| | | | |
|----------|-------------------------|---------|-----------------|
| OPER 531 | Economic Analysis I | OA 4701 | Econometrics |
| OPER 631 | Economic Analysis II | OA 4702 | Cost Estimation |

15. Applied Physics

| AFIT | APPLIED PHYSICS | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| PHYS 635 | Thermal Physics | PH 3782 | Thermodynamics and Statistical Physics |
| PHYS 600 | Dynamics | PH 3152 | Mechanics II Extended Systems |
| PHYS 601 | Electromagnetics | PH 4353 | Topics in Advanced Electricity and Magnetism |
| PHYS 640 | Optics | PH 3292 | Optics and Optoelectrics |
| PHYS 655 | Quantum Mechanics I | PH 4971 | Quantum Mechanics I |
| MATH 508 | Applied Numerical Methods | MA 3232 | Numerical Analysis |
| MATH 504 | Differential Equations of Mathematical Physics | PH 3991 | Physics of Oscillations and Waves II |
| PHYS 670 | Introduction to Solid State Physics | PH 4760 | Solid State Physics |
| PHYS 650 | Kinetic Theory of Plasmas | PH 4661 | Plasma Physics I |
| OENG 620 | Laser Engineering | PH 4054 | Physics of Directed Energy Weapons |
| NENG 651 | Nuclear Physics | PH 3855 | Nuclear Physics |
| PHYS 544 | Fundamentals of Optics II | PH 3252 | Electro-optics |
| PHYS 661 | Atomic and Molecular Spectroscopy | | NO MATCH |
| PHYS 700 | Space Physics | PH 4515 | Physics of the Satellite Environment |

| | | | |
|----------|--------------------------------------|---------|----------------------------------|
| PHYS 744 | Laser Physics II | PH 4662 | Plasma Physics II |
| OENG 650 | Optical Radiometry and Detection | PH 4253 | Sensors Signals and Systems |
| OENG 660 | Introduction to Non-Linear Optics | | NO MATCH |
| OENG 740 | Optical System Design | | NO MATCH |
| OENG 780 | Infrared Technology | PH 4254 | Thermal Imaging and Surveillance |
| | NUCLEAR ENGINEERING SEQUENCE* | | |
| NENG 605 | Physics of Nuclear Explosions | PH 4856 | Physics of Nuclear Weapons |
| NENG 631 | Prompt Effects of Nuclear Weapons | PH 3171 | Explosives and Explosions |
| NENG 660 | Radiation Effects on Electronics | PH 4750 | Solids and Radiation Effects |
| NENG 650 | Nuclear Instrumentation | | NO MATCH |
| NENG 671 | Environmental Transport | | NO MATCH |
| NENG 681 | Nuclear Chemical Engineering | | NO MATCH |
| NENG 685 | Computational Nuclear Engineering | | NO MATCH |
| NENG 721 | Space Nuclear Power | | NO MATCH |
| NENG 790 | Nuclear System Design | | NO MATCH |

*Taught at AFIT only (based on prior agreement between schools)

16. Software Systems Management

| AFIT | SOFTWARE SYSTEMS MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|--|---------|--|
| CSCE 031 | Intro to Discrete Mathematics | MA 3026 | Discrete Mathematics with Applications |
| CSCE 003 | Introduction to Ada | CS 2970 | Structured Programming with Ada |
| MATH 291 | Math Review for Eng Managers | MAR 117 | Single Variable Calculus |
| COMM 310 | Fundamentals of Written Communications | MN 3333 | Managerial Communication Skills |
| CSCE 593 | Software Analysis & Design I | CS 3460 | Software Methodology |
| CSCE 486 | Intro to Data Structures and Programming Design | CS 3300 | Data Structures |
| STAT 526 | Managerial Statistics I | OS 3105 | Statistical Analysis For Management I |
| COMM 687 | Theory & Practice of Professional Communications | MN 3333 | Managerial Communication Skills |
| CSCE 594 | Software Analysis & Design II | CS 4114 | Advanced Topics in Object Oriented Programming |
| STAT 536 | Managerial Statistics II | OS 3106 | Statistical Analysis For Management II |
| ECON 520 | Managerial Economics I | Mn 3140 | Microeconomic Theory |
| IMGT 676 | Software Cost Estimation | OA 4702 | Cost Estimation |
| CSCE 595 | Software Generation and Maintenance | CS 4500 | Software Engineering |

| | | | |
|----------|--|---------|---|
| IMGT 626 | Software Configuration Management | IS 4300 | Software Engineering and Management |
| IMGT 685 | Software Product Assurance | IS 4300 | Software Engineering and Management |
| OPER 562 | Intro to Management Science | OS 3006 | Operation... Research for Management |
| AMGT 602 | Federal Financial Management | Mn 3172 | Public Policy and Budgeting |
| CSCE 589 | Operating Systems | CS 3450 | Operating Systems |
| ORSC 520 | Organization and Management Theory | MN 3105 | Organization and Management |
| CSCE 693 | Principals of Embedded Software | | No Match |
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |

17. Space Operations

| AFIT | SPACE OPERATIONS | NPS | EQUIVALENT COURSE |
|----------|---|---------|---|
| PHYS 519 | Space Environment | PH 2514 | Intro to the Space Environment |
| MECH 431 | Introduction to Space Dynamics | AA 3815 | Introduction to Spacecraft Dynamics |
| OPER 511 | Intro to Space Programs and Operations | SS 3001 | Military Applications of Space |
| PHYS 521 | Space Surveillance | PH 4051 | Concepts in Surveillance, Target Acquisition & Engagement |
| OPER 592 | Space Operations Planning | SS 4002 | Military Operations in Space |
| CSCE 362 | Introduction to Fortran Programming | CS 2450 | Computer Programming with Fortran |
| MATH 509 | Mathematical Methods for Space Operations | MA 3110 | Intermediate Analysis |
| STAT 527 | Introduction to Probability | OA 3101 | Probability |
| STAT 537 | Introduction to Statistics | OA 3103 | Statistics |
| EENG 571 | Space Communications | EC 4590 | Communications Satellite Systems Engineering |
| MENG 432 | Space Propulsion Systems | AA 3851 | Spacecraft Propulsion |
| OPER 571 | Operations Research I | OS 3006 | Operations Research for Management |
| OPER 572 | Operations Research II | OS 3008 | Operations Research Methodology |

| | | | |
|----------|---|---------|---------------------------------------|
| OPER 666 | Military Systems Simulation | OA 3302 | OA System Simulation |
| SMET 646 | Project Management | MN 4307 | Program Management Policy and Control |
| COMM 685 | Communication for Managers and Analysis | MN 3333 | Managerial Communication Skills |
| | | OA 3104 | Data Analysis |

18. Supply Management

| AFIT | SUPPLY MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|---|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Managers |
| QMGT 290 | Introduction to AFIT Computers | IS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| LOGM 510 | Information Support for Management | IS 3183 | Management Information Systems |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |

| | | | |
|----------|--|---------|--|
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |
| LOGM 569 | Maintenance and Production Management | MN 3374 | Production Management: A TQM/L Perspective |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Simulation Modeling for Managerial Decision Making |
| LOGM 628 | Reparable Inventory Management | MN 3377 | Inventory Management |
| AMGT 601 | Governmental Accounting and Financial Management Control Systems | MN 3154 | Financial Management in the Armed Forces |
| LOGM 629 | Consumable Inventory Management | MN 3377 | Inventory Management |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| LOGM 630 | Forecasting Management | MN 3372 | Material Logistics |

19. System Engineering

| AFIT | SYSTEMS ENGINEERING | NPS | EQUIVALENT COURSE |
|----------|--|------------------------|--|
| EENG 712 | Linear Estimation and Control | EC 3410 EC 3310 | Discrete-Time Random Processes Linear Optimal Estimation and Control |
| MECH 620 | Systems Optimization | ME 4731 | Engineering Design Optimization |
| STAT 601 | Probability Theory for Communication and Control | OA 4103 | Advanced Probability |
| SENG 520 | Systems Analysis for Design | ME 2801 | Introduction to Engineering Systems Dynamics |
| SENG 525 | Linear Systems Analysis | EC 2420 | Linear Systems |
| SENG 620 | Topics in Systems Engineering | | No Match |
| MECH 423 | Dynamics of Aerospace Systems | ME 2502 | Dynamics |
| MECH 529 | Dynamics and Control of Flight Vehicles | ME 4821 | Advanced Dynamics |
| MATH 521 | Linear Algebra | MA 3042 | Linear Algebra |
| EENG 540 | Robotics Fundamentals | CS 4313 | Advanced Robotic Systems |
| EENG 620 | Pattern Recognition | | No Match |
| MECH 725 | Man-in-the-Loop Control | CS 4310 | Advanced Artificial Intelligence |
| OPER 520 | Probabilistic Operations Research | OA 3301 OA 4301 | Stochastic Models I Stochastic Models II |

| | | | |
|----------|--|---------|--|
| OPER 750 | Response Surface Methodology | | No Match |
| OPER 766 | Advanced Simulation | OA 4333 | Simulation Methodology |
| OPER 767 | Networks and Combined Optimization | OA 4202 | Network Flows and Graphs |
| OPER 510 | Deterministic Operations Research | OS 3008 | Analytical Planning Methodology |
| OPER 768 | Nonlinear Programming | OA 4201 | Nonlinear Programming |
| STAT 687 | Mathematics of Reliability Theory I | OA 4303 | Sample Inspection and Quality Assurance |
| SENG 685 | Reliability Engineering | AA 4201 | Reliability Engineering and System Safety Management |
| SENG 687 | Advanced Topics in Reliability | | No Match |
| OPER 627 | Systems Simulation and Analysis | OA 3302 | OA System Simulation |
| OPER 766 | Advanced Simulation | OA 4333 | Simulation Methodology |
| OPER 684 | Quantitative Forecasting | OA 4308 | Time Series Analysis |
| SENG 565 | Control and State Space Concepts | ME 4811 | Modern Control Systems |
| MATH 552 | Mathematics of Systems Modeling and Identification | MA 3400 | Mathematical Modeling Processes |
| MECH 712 | Nonlinear Oscillations | EC 4350 | Nonlinear Control Systems |
| ENVR 520 | Environmental Systems Engineering | | No Match |
| ENVR 540 | Environmental Planning | | No Match |

| | | | |
|----------|--|--|----------|
| ENVR 550 | Pollution Prevention and Hazardous Waste Management | | No Match |
|----------|--|--|----------|

20. Systems Management

| AFIT | SYSTEMS MANAGEMENT | NPS | EQUIVALENT COURSE |
|----------|---|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| MATH 291 | Mathematics Review for Engineering Managers | MAR 142 | Matrix Algebra |
| AMGT 600 | Managerial Accounting | MN 3161 | Management Accounting |
| AMGT 602 | Federal Financial Management | MN 3172 | Public Policy and Budgeting |
| STAT 526 | Managerial Statistics I | OS 3105 | Statistical Analysis for Management I |
| SMGT 643 | System Acquisition Management | MN 3301 | Systems Acquisition and Program Management |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| STAT 536 | Managerial Statistics II | OS 3106 | Statistical Analysis for Management II |
| QMGT 675 | Production and Operating Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |
| SMGT 646 | Project Management | MN 4307 | Program Management Policy and Control |

| | | | |
|----------|--|---------|--|
| AMGT 520 | Managerial Economics I | MN 3140 | Microeconomic Theory |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Computer Simulation for Managerial Decision Making |
| AMGT 559 | Life Cycle Cost and Reliability | MN 4310 | Logistics Engineering |
| SMGT 647 | Acquisition Strategy | MN 3105 | Principles of Acquisition and Contracting |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| SMGT 640 | Systems management | EO 4911 | Systems Engineering Management |

21. Transportation Management

| AFIT | TRANSPORTATION MANAGEMENT | NPS | Equivalent Course |
|----------|---|---------|--|
| AMGT 336 | Principles of Financial Management | MN 2150 | Financial Accounting |
| COMM 310 | Fundamentals of Written Communication | MN 3333 | Managerial Communication Skills |
| LOGM 325 | Quantitative Methods for Managers | MA 2300 | Mathematics for Management |
| QMGT 290 | Introduction to AFIT Computers | OS 0123 | Computer Skills Development |
| COMM 687 | Theory and Practice of Professional Communication | MN 3333 | Managerial Communication Skills |
| STAT 525 | Applied Statistics for Managers I | OS 3105 | Statistical Analysis for Management I |
| LOGM 568 | Logistics Management | MN 3372 | Material Logistics |
| STAT 535 | Applied Statistics for Managers II | OS 3106 | Statistical Analysis for Management II |
| QMGT 675 | Production and Operations Methods | MN 3374 | Production Management: A TQM/L Perspective |
| | | OS 3006 | Operations Research Methodology |
| LOGM 590 | Computer Simulation for Managers | MN 4312 | Simulation Modeling for Managerial Decision Making |
| LOGM 617 | Transportation Systems and Strategic Mobility | MN 4376 | Defense Transportation System |

| | | | |
|----------|--|---------|--|
| LOGM 569 | Maintenance and Production Management | MN 3374 | Production Management: A TQM/L Perspective |
| LOGM 510 | Information Support for Managers | IS 3183 | Management Information Systems |
| LOGM 618 | Transportation Management | MN 3373 | Domestic Transportation Management |
| | | MN 4373 | International Transportation Management |
| CMGT 523 | Contracting and Acquisition Management | MN 3303 | Principles of Acquisition and Contracting |
| AMGT 520 | Managerial Economics | MN 3140 | Microeconomic Theory |
| ORSC 542 | Management and Behavior in Organizations | MN 3105 | Organization and Management |
| LOGM 619 | Transportation Policy | MN 4376 | Defense Transportation System |

APPENDIX B - NPS CLASSROOM USAGE/AVAILABILITY

Bul'ard

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------|
| B-104 | 21 | 4 | 7 |
| B-202 | 21 | 13 | 5 |

Bullard

| <u>total rooms</u> | <u>avg size</u> | <u>avg size (30 max)</u> | <u>total rooms avail</u> | <u>avg size</u> | <u>avg size (30 max)</u> |
|--------------------|-----------------|--------------------------|--------------------------|-----------------|--------------------------|
| 2 | 21 | 21 | 2 | 21 | 21 |

Root

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------|
| R-109 | 35 | 8 | Specialty class |
| R-200A | 36 | -- | Other use |
| R-200D | 20 | -- | Other use |
| R-202 | 54 | -- | Other Use |
| R-202A | 8 | -- | Student study |
| R-202C | 30 | 12 | 0 |
| R-204 | 36 | -- | Academic groups |
| R-204A | 20 | -- | Student study |
| R-208 | 30 | 20 | 5 |
| R-210 | 30 | -- | Health Rsc Ctr |
| R-228 | 20 | -- | Civilian Ed |
| R-240 | 30 | 26 | 4 |
| R-242 | 30 | 26 | 2 |
| R-256 | 30 | -- | Distance Learn |
| R-260 | 30 | -- | Distance Learn |

Root

| <u>total rooms</u> | <u>avg size</u> | <u>avg size (30 max)</u> | <u>total rooms avail</u> | <u>avg size</u> | <u>avg size (30 max)</u> |
|--------------------|-----------------|--------------------------|--------------------------|-----------------|--------------------------|
| 15 | 29 | 27 | 4 | 30 | 30 |

Spanagel

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------------|
| S-117 | 62 | 31 | 1 |
| S-136 | 37 | 30 | 1 |
| S-138 | 21 | 26 | 5 |
| S-140 | 21 | 26 | 3 |
| S-208 | 46 | 15 | 5 |
| S-221 | 51 | 28 | 2 |
| S-224 | 18 | -- | EW Study space |
| S-226 | 20 | 25 | 3 |
| S-228 | 20 | -- | C ³ Study space |
| S-231 | 62 | 30 | 1 |
| S-248 | 18 | 17 | 4 |

| | | | |
|-------|----|----|---|
| S-310 | 21 | 14 | 1 |
| S-316 | 47 | 29 | 2 |
| S-321 | 62 | 21 | 4 |
| S-332 | 24 | 10 | 6 |
| S-342 | 20 | 28 | 2 |
| S-408 | 28 | 32 | 2 |
| S-421 | 78 | 29 | 2 |
| S-429 | 26 | 42 | 3 |

Spanagel

| <u>total</u> | | <u>avg size</u> | <u>total rooms</u> | | <u>avg size</u> |
|--------------|-----------------|-----------------|--------------------|-----------------|-----------------|
| <u>rooms</u> | <u>avg size</u> | <u>(30 max)</u> | <u>avail</u> | <u>avg size</u> | <u>(30 max)</u> |
| 19 | 36 | 25 | 17 | 38 | 26 |

Ingersoll

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------|
| I-119 | 35 | 14 | 5 |
| I-221 | 33 | -- | Other use |
| I-260 | 51 | 32 | 3 |
| I-263 | 27 | 12 | 6 |
| I-265 | 36 | 22 | 4 |
| I-267 | 39 | 19 | 4 |
| I-271 | 46 | 26 | 2 |
| I-280 | 35 | 26 | 4 |
| I-282 | 36 | 2 | 7 |
| I-285 | 27 | 22 | 3 |
| I-322 | 40 | 24 | 2 |
| I-323 | 31 | 28 | 2 |
| I-325 | 31 | 20 | 5 |
| I-361 | 60 | 14 | 5 |
| I-365 | 32 | -- | Student study |
| I-366 | 32 | -- | Other use |
| I-368 | 32 | -- | TQL |
| I-369 | 32 | -- | Other use |
| I-377 | 25 | -- | Other use |
| I-379 | 16 | -- | Other use |
| I-380 | 16 | -- | Other use |
| I-381 | 28 | 5 | 7 |
| I-386 | 25 | 20 | 3 |
| I-387 | 30 | 24 | 1 |

Ingersoll

| <u>total</u> | | <u>avg size</u> | <u>total rooms</u> | | <u>avg size</u> |
|--------------|-----------------|-----------------|--------------------|-----------------|-----------------|
| <u>rooms</u> | <u>avg size</u> | <u>(30 max)</u> | <u>avail</u> | <u>avg size</u> | <u>(30 max)</u> |
| 24 | 33 | 28 | 16 | 36 | 29 |

Glasgow

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------|
| G-B13 | 36 | -- | HRO Training |
| G-B14 | 33 | 10 | 6 |
| G-B15 | 26 | 23 | 2 |
| G-B17 | 34 | 14 | 5 |
| G-B18 | 35 | -- | 7 |
| G-B19 | 36 | -- | Specialty class |
| G-103 | 26 | -- | Conference room |
| G-109 | 180 | 0 | 9 |
| G-110 | 36 | 25 | 2 |
| G-113 | 36 | 23 | 2 |
| G-114 | 36 | 27 | 3 |
| G-115 | 44 | 26 | 3 |
| G-117 | 20 | 13 | 3 |
| G-118 | 38 | 29 | 1 |
| G-122 | 48 | 26 | 1 |
| G-129 | 36 | 24 | 3 |
| G-130 | 36 | 28 | 3 |
| G-133 | 36 | 21 | 3 |
| G-303 | 18 | 12 | Specialty class |
| G-306 | 18 | 18 | Specialty class |
| G-386 | 18 | 8 | Specialty class |
| G-387 | 18 | 27 | Specialty class |
| G-388 | 18 | 4 | Specialty class |
| G-389 | 18 | 4 | Specialty class |

Glasgow

| <u>total</u> | | <u>avg size</u> | | <u>total rooms</u> | | <u>avg size</u> |
|--------------|-----------------|-----------------|--|--------------------|-----------------|-----------------|
| <u>rooms</u> | <u>avg size</u> | <u>(30 max)</u> | | <u>avail</u> | <u>avg size</u> | <u>(30 max)</u> |
| 24 | 37 | 26 | | 15 | 43 | 27 |

Halligan

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|---------------|-----------------|--------------------|----------------------|
| H-109 | 33 | 12 | 6 |
| H-121A | 33 | 33 | 0 |
| H-121B | 33 | 22 | 1 |
| H-123 | 33 | 27 | 1 |
| H-125 | 33 | 37 | 0 |
| H-201E | 32 | 32 | 1 |
| H-201F | 32 | 34 | 1 |

Halligan

| <u>total</u> | | <u>avg size</u> | | <u>total rooms</u> | | <u>avg size</u> |
|--------------|-----------------|-----------------|--|--------------------|-----------------|-----------------|
| <u>rooms</u> | <u>avg size</u> | <u>(30 max)</u> | | <u>avail</u> | <u>avg size</u> | <u>(30 max)</u> |
| 7 | 33 | 30 | | 7 | 33 | 30 |

Bldg 224

| <u>Room</u> | <u>#Capacity</u> | <u>Usage Hours</u> | <u>Availability*</u> |
|-------------|------------------|--------------------|----------------------|
| M-112 | 24 | 9 | 5 |

Bldg 224

| <u>total</u> <u>rooms</u> | <u>avg size</u> | <u>avg size</u> <u>(30 max)</u> | <u>total rooms</u> <u>avail</u> | <u>avg size</u> | <u>avg size</u> <u>(30 max)</u> |
|------------------------------|-----------------|------------------------------------|------------------------------------|-----------------|------------------------------------|
| 1 | 24 | 24 | 1 | 24 | 24 |

* Number of four credit classes that can be scheduled to conform with department scheduling practices.

Total Availability(# of extra courses/sections which can be scheduled) = 201.

B = Bullard Hall
R = Root Hall
S = Spanigal Hall
I = Ingersoll Hall
G = Glasgow Hall
H = Halligan Hall
M = Bldg 224

62 total classrooms available
x 9 courses per week per classroom
558 courses can be scheduled
- 201 total availability
357 scheduled courses¹

357 scheduled courses
÷ 1800 total students
.1983

.1983 = X ÷ [1800 NPS students + 445 AFIT students]

X = .1983 x 2250

X = 445 scheduled courses required

445 - 357 = 88 additional courses required

There are 201 classroom slots available to hold these additional 89 courses.

¹ - Separate sections of the same course are treated as separate courses

APPENDIX C - LABORATORY USAGE

Bullard

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|----------------|
| B-100A | 15 | 0 | ECE power sys |
| B-201 | 21 | 4 | ECE signals |
| B-201C/D/E | 20 | 8 | |
| B-208 | 25 | 3 | ECE servo ctrl |
| B-224 | 24 | 1 | ECE opti-elec |

Root

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|----------------|
| R-117A | 18 | -- | Brief room |
| R-123 | N/A | N/A | TS lab |
| R-123N&S | 20 | 3 | MR idea lab |
| R-125 | 8 | -- | |
| R-125A | N/A | N/A | Rsrch area |
| R-222 | 15 | -- | Sun stations |
| R-222 | 20 | -- | PC stations |

Spanagel

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|--------------------------------|
| S-006 | N/A | -- | Nuclear Physics |
| S-025 | 12 | -- | Sonar tank |
| S-019 | 12 | -- | Op equip for anechoic equip |
| S-107 | 12 | -- | Acoustics lab |
| S-111 | 12 | -- | Applied Physics |
| S-121 | 12 | -- | Applied Physics |
| S-125 | 12 | -- | Comp/Sim lab |
| S-127 | 12 | 9 | Applied Physics |
| S-135 | 12 | 4 | Electro-optic |
| S-263 | 15 | 8 | |
| S-301 | 20 | -- | MF Term |
| S-303 | 20 | -- | ECE VLSI |
| S-307 | 14 | -- | ADA lab |
| S-309 | 14 | -- | ADA lab |
| S-341 | 16 | 9 | Graphics |
| S-419 | 15 | 3 | ECE microwave |
| S-431 | 20 | 2 | PC stations |
| S-543 | N/A | N/A | ECE 15 radar |
| S-612 | 12 | 6 | ECE radar |
| S-703 | 10 | -- | ECE microwave |

Ingersoll

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|------------------|
| I-158 | 6 | 2 | Software Metrics |
| I-224 | 18 | 11 | PC stations |
| I-250 | 18 | 16 | PC stations |
| I-364E | 13 | 4 | Mainframe Term |
| I-374 | 1 | 8 | Case Tool lab |

Glasgow

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|----------------|
| G-123 | 20 | 6 | Mac lab |
| G-203 | 33 | 12 | PC stations |
| G-318 | 22 | 24 | UNIX stations |

Halligan

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|----------------|
| H-138 | 11 | 2 | |

BLDG 215

| <u>Room #</u> | <u>Capacity</u> | <u>Usage Hours</u> | <u>Purpose</u> |
|---------------|-----------------|--------------------|----------------|
| N/A | N/A | 8 | Aero labs |

LIST OF REFERENCES

1. Air Force Institute of Technology (AFIT) Catalog. Registrar and Directorate of Admissions, AFIT, Wright-Patterson AFB OH, 1993-1995.
2. Baldwin J. A. VADM. "Educating Tomorrow's Leaders Today." Defense, 56-63 (July/August 1993)
3. Calico, Robert A. Jr., Dean, AFIT School of Engineering. Personal Interview. Air Force Institute of Technology, Wright-Patterson AFB OH, 13 May 1994.
4. Eisenhower, Dwight D. General of the Army. "Command in War." Speech given at the National War College, 30 October 1950.
5. Faculty Handbook. Air Force Institute of Technology, Wright-Patterson AFB OH (31 August 1989)
6. Koz, Joseph P., Colonel USAF, Commandant, AFIT. Personal Interview. Air Force Institute of Technology, Wright-Patterson AFB OH, 13 May 1994.
7. Naval Postgraduate School (NPS) Catalog. Registrar and Director of Admissions, NPS, Monterey CA, 1994.
8. Perry, William. "1995 Base Realignments and Closures (BRAC 95)" Memorandum. Department of Defense, Washington DC. 7 January 1994.
9. Schuppe, Thomas F., Colonel USAF, Dean, AFIT Graduate School of Logistics and Acquisition Management. Personal Interview. Air Force Institute of Technology, Wright-Patterson AFB OH, 12 May 1994.
10. -----. Naval Postgraduate School Mission and Functions, OPNAVINST 5450.210B. Department of the Navy, Washington DC, 1993.

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